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E S S A Y S
U P O N
N A T U R A L H I S T O R Y,
A N D O T H E R
M I S C E L L A N E O U S S U B J E C T S,

B Y G E O R G E E D W A R D S,
Fellow of the ROYAL SOCIETY, and of the SOCIETY
of ANTIQUARIES, LONDON.

T O W H I C H I S A D D E D,
A C A T A L O G U E, I N G E N E R I C A L O R D E R,
O F T H E
B I R D S, B E A S T S, F I S H E S, I N S E C T S, P L A N T S, &c.
contained in Mr. EDWARDS' Natural History.

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P R E F A C E.

THE greatest part of the following
Essays have already appeared before
the public in Mr. *Edwards' Natural
History*, but in a detached and unconnect-
ed form, and at an expence perhaps rather
too great for many who delight in Natural
History.

It was therefore to accommodate such,
and to assist the curious in their re-
searches, or any future writer upon this
subject, that the editor has been induced
to this publication: and to make it still
more generally useful, there is added a ca-
talogue, in generical order, in English and
French, of the names of all the *birds*,
beasts, *fishes*, *insects*, *plants*, &c. &c. con-
tained

tained in the said Natural History; which has the peculiar advantage over all other works of that nature, to be original in its figures, as well as descriptions.

* * * The numbers added to the articles in the Generical Catalogue refer to the plates in the History where the subjects are described and figured.

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ESSAY I.

ON THE WISDOM AND POWER OF GOD IN THE WORKS OF CREATION.

CHAP. I.

THE wisdom and power of God are manifest to all rational creatures, from a contemplation of his wonderful works in the creation of this world : He hath formed every beast of the field, bird of the air, and fish of the waters : He hath also formed every tree and plant ; every creeping insect was made by him. All that the earth, air, or waters produce, were created by God's power. Now, as man is the only rational being in this world, it seemeth plain, by natural light, that the dominion of all creatures was given to him by God ; therefore,

B since

since man's obligation to God is greater than that of any other creature, his acts of humiliation, adoration, and gratitude, ought to be, in some degree, proportionable to the favour and benefits he hath received. Amongst the many acts of gratitude we owe to God, it may be accounted one, to study and contemplate the perfections and beauties of his works of creation. Every new discovery must necessarily raise in us a fresh sense of the greatness, wisdom, and power of God : He hath so ordered things, that almost every part of the creation is for our benefit, either to the support of our being, the delight of our senses, or the agreeable exercise of the rational faculty. If there are some few poisonous animals and plants fatal to man, these may serve to heighten the contrary blessings ; since we could have no idea of benefits, were we insensible of their contraries ; and seeing God has given us reason, by which we are able to choose the good and avoid the evil, we suffer very little from the malignant parts of the creation.

God

God hath given to brute animals a certain law whereby to govern themselves, which is called Instinct ; it being an inward implanted tendency to particular actions, from which they cannot stray. This instinct, or inward force, appears to be stronger in brutes than in the human species, and supplies to them the defect of reason. Man hath an instinct also, but much weaker than that in other animals: to make up that want God hath given him a glimmering of that heavenly light called Reason. Now, as man was designed lord of this lower world, and the possession of every part thereof was given to him, the instinct of brutes would not have been sufficient ; nor would reason itself have been enough without some inward appetites ; for without instinct his generation would probably have soon been at an end ; and we should have neglected the support of our individual bodies, had we only reason, and not hunger to tell us, that eating was necessary to life.

Reason is our director when we change our country from one extreme climate to another : The Russian, though inclosed in houses,

firmly secured against the penetration of the cold air, and inwardly heated with stoves, when he travels into Persia and India, is directed by the same reason to sleep in the open air, and on the tops of houses, and to use machines to agitate and bring fresh air about him ; and, on the contrary, the Ethiopian, though his lodging be in the open plains and deserts, and he without any clothing, yet, when he is brought to Europe, he is glad to screen himself in warm houses, and warm himself by fires, and cover himself with thick clothing. Reason giveth man this pre-eminence over brute beasts ; by it he can make almost all parts of the world habitable to him by arts and inventions to screen himself from the great heats in some parts, and defend himself from the piercing colds in other parts of the world. No brute animal can thus indifferently inhabit any part of the world, because their innate laws are unchangeable, and accommodated only to such climates as nature has placed them in ; so that I believe there is no creature whose race is spread in all habitable parts of the world as is that of the human species. Each animal seems to have his appointed climate, out of which,

if

if he be removed to one far different, his generation ceaseth, or looseth its first properties ; whereas such creatures, as continue where nature placed them, hardly vary at all from the species from which they sprang, preserving the same magnitude, form, and colours throughout all ages ; for it seemeth as if God had set particular marks of distinction on each species, from which they cannot stray.

From this reason I found the agreement between each different generation of animal and plant, which always continues to bear the form and likeness of those in which they were first inclosed. Indeed some domestic animals and plants differ, in some sort, from their first parents, which were savage. I take these differences not to be very material, and to proceed from the unnatural food, habitation, and other circumstances that may alter the plant or animal in magnitude or colour ; which is not material, seeing these things, so made domestic, if turned again to their native habitations,

tations, in a generation or two cast off those accidents attained by unnatural situations, and recover their first forms and colours stamped on them in the first creation of the whole species.

C H A P.

C H A P. II.

MANY who have wrote in former times on nature, suppose that all things, which were at first created by God on this globe, have been ever since, by his Providence, continued through an implanted seminal power down to these times, and will continue as long as the earth endureth: yet some great naturalists in these days are quite of a different opinion, and their reasons for these opinions are founded on the great variety of fossil substances found daily in many parts of the world, resembling animals and parts of animals now in being, as well as animals and parts of animals not to be met with by the most laborious searches of the curious.

From the general face of things we may safely conclude there have been great revolutions on the face of this earth, which in many places seem to have been caused by a great quantity of water prevailing, and passing very swiftly over its surface, breaking up its lower parts, and rear-
ing

ing them into mountains, and carrying other parts which have lain high into the sea ; so that in many places we find buried, in high mountains far inland, substances which received their first formation in the sea, and in some low grounds, deep buried near the sea, we find many things that received their first forms in the mountains. It is probable some of these great revolutions might be so wide spread at once, as utterly to extinguish some animals that were in God's original creation of this world.

If we consider the beautiful parts of nature, so far as they charm the sight by the lustre and variety of colours, and the fineness of the texture of parts, I think many will agree, that the fine things produced may charm the eye, as much as the most studied and harmonious compositions in music can charm the ear. But it is common to say, that people who have no delight in music, have no ear : And I think, we may as justly say of those, who are not moved to admiration when the beauties of nature present themselves, that they want eyes. Whether or not nature designed the beautiful forms

forms and colourings we perceive in several kinds of insects and other animals, as things to delight and please the sense of those animals, and others of the brute creation : Or whether they were designed principally for the delight and contemplation of man the lord of this lower world, is a question. A reason, in my opinion, why insects are not sensible of their own beauty, is the form of their eyes, which let in the light through a kind of net-work, which must discover the objects in a confused manner ; or if we suppose each little part a distinct eye, they are so small that an object must almost touch them to be distinctly perceived in its parts, and the quantity taken in at once so small, that the entire form of one insect can hardly appear plain to another ; these eyes may indeed serve them to distinguish opaque bodies from the clear air they fly in ; and, when they approach very near, to pick out small particles lying on leaves and fruits, which supply most insects with food.

Now, as the eyes of man seem to be more adapted than those of insects to receive the various forms and colours of natural things, I am
of

of opinion, that God principally designed these things, not only to please and delight the outward senses of man, but that the contemplation of them should point out to the mind the surprising manner of God's method of working who created all things ; and this may serve as natural arguments of his infinite wisdom and power.

Mr. *Horsley*, in his *Britannia Romana*, making a sort of apology for that work in his preface, has these words, which will not be amiss to quote for my present purpose. “ I have always looked on it as an instance of divine wisdom, that it should be so ordered that different men have such different tastes and inclinations. By this means the several parts of knowledge are more cultivated : And I think we owe our thanks to any one who will apply himself to the study of any particular thing, though it seem minute, and may not suit our taste or inclination to pursue it ourselves. This gives us, at least, an opportunity of knowing, on easier terms, what can be said on that subject.”

It

It is always necessary that every age should labour to discover something, and not sit down content with the discoveries of our forefathers; for experience shews, that the knowledge of our ancestors dwindles away, and decays daily; for such is the nature of time, that it obscures or destroys the knowledge of past ages by the many wasteful events which happen in a long course of years, such as fire, rapine, inundations, loss of the liberties of countries, and many other things. But, more than all these, the change of languages affects our knowledge; for no language continues the same for many centuries: inscriptions indeed have continued some thousands of years, but when the languages are dead in which they are wrote, the sense of them by ages becomes darker and darker, till at last they are utterly obscure, as we find the most ancient are; witness the monuments of the ancient Egyptians, the ruins of Persepolis, Palmyra or Balbeck, and many others in divers parts of the world which have almost outlived their descriptions; so that we cannot depend on the knowledge of the ancients as a perpetual fund; but must gather what we can from them, and add to it as much as we can of our own, that the stock we have may be kept
up

up by adding something in the room of what must inevitably be lost; for if we sit down content with what is already known, which is a knowledge evidently decreasing every day, in a few ages we may know nothing, and be reduced to a state equal to the wild Americans, since we know that Europe itself hath been well nigh reduced to such a state a few centuries ago, by falling into a superstitious lethargy, neglecting all farther improvements of knowledge, and despising reason, nature, and the evidence of sense.

Every one ought to attain to as high a degree of natural knowledge as he can, for a deep knowledge in nature has detected many false pretenders to inspiration, prophecy, and the like, while the ignorant in nature and her laws have been deluded by the meanest and lowest pretenders, such as diabolical possessions, fantastical apparitions, dreams, good and bad omens, and the like.

As arts have been brought by gradual steps, from one degree of perfection to another, by
joining

joining the knowledge of past times, left us in the writings of those that are gone before, with the discoveries and experience of the present times, so even the knowledge of nature itself hath been multiplied by the various degrees of conception, and different powers of penetration that have been given by God through past ages to mankind, which have been handed down through the records of time to us. Without this knowledge of other men joined to our own, our knowledge would be like that of savage people who live together in small tribes or families, and have nothing but mere mother wit and pure natural capacity, chiefly derived from the senses, to direct them, they not knowing what any of their ancestors said or thought before them for want of characters to express words ; so that each man's knowledge is his own, or has little assistance from others : I do not mean, that, while we are searching into nature's works, we should neglect the curious arts and inventions of men ; for by being well skilled in arts we are enabled the better to make discoveries in nature. Besides, a fine art lost may never be recovered ; but
nature,

nature, though at present unknown by searching, may at one time or other be found, because she always endureth and continueth the same. Art and nature, like two sisters, should always walk hand in hand, that so they may reciprocally aid and assist each other.

C H A P.

C H A P. III.

MAN, when he beginneth to exercise his rational faculties, ought to set before his intellectual mind the ideas of truth and falshood, and endeavour to find out, in the most strict and absolute sense, what they are ; and, when he hath found them, he ought to govern all his actions by the former, and avoid the latter : but it is exceeding hard to discover what truth is in a world of falshood and controversy, where all of us suck in error with our milk. Is not great part of the world taught to believe, that their senses are liars, and that things which appear to be the same, to the strictest scrutiny of our senses, are really and absolutely quite otherwise ? Many we know suffer themselves to be led into such inconsistent beliefs as these ; but it is a fixed and firm article of my private faith, that God hath given us our senses as a touchstone of truth ; and that when any writing, tradition, or bold assertion, advances any opinions, that directly and flatly contradict the senses which God hath given
us

us to judge by, they are absolute falshoods, and ought to be rejected of all mankind. If we can discover what truth and falshood are really, we then have grounds to reflect upon, and may form our reflections into reasonings; but what right reason is we shall find it more difficult to discover, than what is simple truth and falshood: for our conceptions of matter, being only what enter by the dark doors of our senses, are, when entered, to one man one thing, and to another quite a different thing, which maketh human reason so fallacious and various; for our reason proceeding from sense, and sense being different, or receiving different ideas from the same object by different men, it follows of necessity, that there is no such thing absolutely as a general human reason, which is right and the same, the standard of which may be conveyed by writing, or tradition, from one age to another; but that every man hath his own particular reason, which is different in men according as God hath given them strength or weakness in their understanding to judge of such things as enter by the senses. It seemeth to me, that in various men the senses differ infinitely; for that colour which is a favourite

vourite in the eyes of one, is indifferent or disagreeable to another; which, perhaps, may proceed from differentt incltures in the crystalline humour; and some sounds are indifferent, or perhaps displeasing to some, though they fill others with the highest rapture. Men vary in the same manner in the senses of touching, tasting, and smelling: human reason also receives other impressions (which generally cleave too fast to it) such as proceed from the different educations, religions, and customs of different times and places. For all who have seen but a little of the world know how very different the general reasonings of one country are from those of another; and he who has been slightly conversant in history but a few ages backward, will find, that the opinions and reasonings of the same place and people, in an age or two, are quite transformed and changed; so that I cannot see that we have, in our imperfect state, any such thing as right reason founded on demonstration, except in some few mathematical cases, which must constrain the assent of all men. Therefore, we cannot certainly conclude on hardly any thing without controversy, we must

steer the best course we can, setting before our eyes truth as the port we endeavour to gain, which ought always to be our director in opinions and actions, in relation to God and man, as well as in our general practices and speculations in the world.

He that would write any thing in general on nature, or on any particular natural subject, ought, so far as his faculties will permit him, to penetrate into its sources, and trace it backward, if possible, to find out the first cause and mover of all things. If we consider ourselves, and the animal beings that inhabit the face of this globe, we must wonder, at first, how they came to be; but, when we think of the inscrutable springs of life and motion, we must be astonished to the highest degree, not knowing from whence these things spring: and we can solve these inconceivable things no other way, than by supposing there must exist some great, invisible, inconceivable, all-wise, and all-powerful Creator; since the visible creation is sustained always, producing the same forms of natural things, which succeed from one generation to another, through
the

the course of time; which could not be, if Chaos had prevailed, as some have taught; for were the immense mass of matter without a living, all-powerful being to animate it, it must rest without motion, or act by a fermentation which would always generate new and monstrous forms. Now, since from natural light we have discovered a God of infinite power and wisdom, whose attributes are all immensurable and infinite, we cannot suppose his kingdom less than eternal; nor his space, or matter, less than immense: by eternity I mean time, not as measured by the course of a planet in any system, but a constant, continued succession of duration, that shall know no end; by immensity I mean the greatest given quantity of matter, or space, infinitely multiplied, which infinite multiplication will always fall infinitely short of the immense quantity of matter; for if we cast our thoughts beyond this lower system, and dive into the endless depths of space, we are utterly lost; because the height, depth, and extension on all sides, flies away infinitely faster, and more distant, than the swiftest and most extended thought can follow. As the greatest part of matter is to be multiplied

without end, so is the least part of matter to be divided infinitely, notwithstanding the false doctrine of atoms, the least or indivisible parts of matter, and the seeming contradiction of infinite numbers contained in finite space; for God, by his power, can as easily pierce infinitely into a small thing, as extend his dominion through the regions of immensity.

On this principle of infinite number contained in finite space, I suppose that God, by one act of his will and power, created the first living and individual principle of every single, generating, created being, that hath made, or shall hereafter make its appearance in the world: these living and individual principles, being inclosed one within another infinitely, were placed in the first visible individuals of each species; and it is the work of time and generation gradually to bring to light the inclosed and hidden principles, which, as their progenitors decay and fall off, extend themselves to their natural destined sizes, in order to keep up a constant succession of each species. The precise exactness of size, colour, shape, and other conditions

ditions of animals and plants, which they have retained in all ages, wherein history hath given us any account of them, hath induced me to believe, that all the individuals of each species were produced at the same time, by one act of the will and power of God. The animalcula discovered in the *semen masculinum* of all living creatures by the laborious M. *Van Leeuwenboeck*, in his microscopical observations, and, since his time, confirmed by many others, is, I think, a strong argument for the above opinion.

To proceed, and come a little nearer to my purpose :

If a man may be allowed truly to declare what spirit he is possessed with, as some of our modern enthusiasts have falsely, yet boldly done ; I must confess, that a zeal for expressing natural things, with the utmost truth and preciseness, hath always inspired me, even to such a degree, that I have sometimes been afraid it would rise to something like what appears in
bigots,

bigots, who pretend to inspiration ; but as I never was a favourer of such enthusiastic or designing men, so I was always on my guard, lest my natural reasoning should be corrupted by flights, of which I could give no satisfactory account to the common sense and understanding of mankind.

C H A P.

C H A P. IV.

MAN is a creature too weak and imperfect to trace the works of the Great Creator in their just and natural gradations ; yet he, with all humility and gratitude, ought to own, that, of all God's visible creatures, he is under the greatest obligations to his Creator, for having given to him the first place amongst created beings in this lower world, and also the command, dominion, and rule over all the beings inferior to himself that cover the face of this globe, having even denied them the means of escaping from man's unbounded will and tyranny. The human race is not only thus superior to the other creatures on this earth, but each particular man seems intended by his Maker to be equally free, and not subjected to the arbitrary will of any other man. Tyrants over men are the effect of popular depravity, vice, and unbounded ambition ; and, when
usurped

usurped power persecutes, oppresses, and tortures mankind beyond a degree of human sufferance, a door is left open for their escape, which Providence has denied to brutes. The goodness of God to man is a mystery our weakness can never unravel. We are all naturally tyrannical, and all seek and endeavour to gain power and dominion over each other. We, with regret, submit to the superior power of those stronger or more powerful than ourselves. Our compacts with one another arise from the mutual jealousy and suspicion each one has of his neighbour's villainy. Should a just, sublime, and highly rational created being, far above the condition of man, condescend to give us a real history of some of our greatest heroes, wisest lawgivers, and canonized saints, what shocking scenes of lawless force, brutal cruelty, cunning, circumvention, deceit, vile hypocrisy, and sacrilegious frauds, would such a faithful history be filled with ! It would certainly make men appear more infamously wicked, than men have made infernal spirits in the aerial histories they have given of them.

If

If we would know what men are in a state of nature, we may turn our eyes on despotic princes, and we shall see them acting without any law or conscience to restrain them from what their natural inclinations dictate. To sum up all the faculties of man, we must examine the whole brute creation, and take in all their qualities, such as in man would claim the names of virtues or vices: and this will give us the various mixtures of virtue and vice in the human species, in some of whom the virtues are predominant, and in others the vices, though none of them are without a mixture of both, and they are more or less virtuous or vicious in proportion to such mixture.

Had man been created benevolent to all of his own kind, having no will or desire to subdue or rule over others, or invade their property, and likewise endowed with a desire to assist and help his weaker neighbour; had peace and tranquillity been inviolably maintained amongst the whole race; the world, before this time, must have been

so overstocked with people, that it would have been impossible for them to subsist in it ; and the animals, &c. which were given by God for the food of man and of each other, would have been nearly, if not quite extinct : for we know, that many of the wild animals require vast uninhabited plains, forests, and mountains, to breed, feed, and bring up their young. But Providence has ordered things otherwise, by putting enmity between man and man, and between nation and nation, in order to prevent the over-great increase of the human kind, which must consequently have greatly lessened, if not entirely extirpated, many of the animal species, before the still increasing number of men had proved their own destruction, which finally must have been the case : but it is reasonable to believe, that Providence equally regards the preservation of all the animals, &c. that are created.

Wise states, that have superstitious and ignorant subjects, are often under a necessity of making such laws as consist little with reason,

son, common sense, or the natural liberties of mankind : they often are obliged by such methods to stop the course of popular clamour, which would otherwise reduce a well-established state to anarchy and confusion. The remedy against such inconveniencies is a slack execution of such bad laws. I believe, the wisest of the human race do not expect to find real and absolute moral justice and right amongst the most honest and most experienced of their own species ; for right and wrong, virtue and vice, &c. are differently understood, according to the different modes, customs, and religions of different countries, and different times in the same countries ; though, in the unchangeable Divine Will, it would be great presumption in us to suppose the least variation or shadow of change. Divine justice and rectitude must be absolutely and constantly the same ; but, as we are in our nature very imperfect beings, our conceptions, words, and actions, must be all imperfect ; insomuch, that were ten of the wisest amongst men, living at the same time,

time, and under the same government, to form a plan of moral, universal, absolute rectitude in the conduct of human life, they would all widely differ from each other.

CHAP.

C H A P. V.

IN all countries, whether agriculture be promoted or neglected by mankind, nature assists to sow and plant as well as to fertilize the earth. The seeds of lofty trees are many of them winged; and when they are ripe, the autumnal winds blow them off, and scatter them at a great distance from their mother plants: others are in pods, or husks, and not capable of being carried by the motion of the air; but Providence hath given them as food to birds, who carry them to distant places, and in feeding scatter part of the seed in soils proper for them to take root in and spring up. Even the droughts of the autumn contribute to increase and propagate trees and plants; for by causing deep chinks or chaps in the earth, the seeds of trees, and larger plants, that require depth, are lodged at proper depths for their growth, and, at the same time, secured from such animals as feed on them. The seeds of annual plants
are,

are, many of them, provided with a light down, by which they are enabled, with the help of the wind, to rise to great heights, and spread themselves very wide to propagate their species in distant lands. The sun, by its annual visits to the northern and southern tropics, alternately gives action and rest to vegetation. The floods, which in many countries fall at certain seasons from the mountains, cover the plains, and enrich the soil by the sediment of their waters. The winter's frosts also, by expanding the moisture contained in the earth, loosen and break the clods, so as to make them give way to the spreading roots of vegetables: swine, moles, and some other animals, root up and loosen the earth, and fit it to receive the seeds of plants.

The Rev. Mr. Robinson, rector of Ousby in Cumberland, in his Natural History of Westmoreland and Cumberland, part II. page 97, says, "that birds are natural planters of all
 " sorts of wood and trees: they disseminate the
 " kernels upon the earth, which, like nurseries,
 " brings them forth till they grow up to their
 " natural

“ natural strength and perfection.” He says,
 “ About twenty five years ago, coming from
 “ Rose-Castle early in the morning, I observed
 “ a great number of crows very busy at their
 “ work, upon a declining ground of a mossy
 “ surface : I went out of my way on purpose to
 “ view their labour ; and I found they were
 “ planting a grove of oaks. The manner of their
 “ planting was thus : they first made little holes
 “ in the earth with their bills, going about and
 “ about till the hole was deep enough, and then
 “ they dropped in the acorn, and covered it
 “ with earth and moss : the young plantation is
 “ now growing up to a thick grove of oaks, fit
 “ for use, and of height for the crows to build
 “ their nests in. I told it to the owner of the
 “ ground, who observed them to spring up, and
 “ took care to secure their growth and rising.
 “ The season was at the latter end of autumn,
 “ when all seeds were fully ripe.”

Mr. Robinson seems to think, that Providence had given the crows this instinct solely for the propagation of trees ; but, I imagine,

it

it was given them principally for their own preservation, by hiding provision in time of plenty, in order to supply them in a time of scarcity ; for it is observed, in tame pyes and daws kept about houses, that they will hide their meat when they have plenty, and fetch it from their hiding-places when they want it : so that such an instinct in these birds may answer a double purpose, both their own support in times of need, and the propagation of the trees they plant ; for, wherever they hide a great number of nuts or grain in the earth, we cannot suppose they find them all again, but that as many will remain in the plat of ground they make use of, as can well grow by one another. Nature hath been amazingly bountiful in the wonderful increase of seeds in many vegetables ; insomuch that, with proper culture, the face of the whole earth might be covered, from the seeds of a single plant, in a very few years. The seminating power in animals also equals, if not exceeds, that of plants : if we examine some of the fishes and insects, we find what great numbers of their species they are able to produce.

But

But all these great increasers are liable to perpetual destruction, they being the natural food of other animals, and of one another : the larger animals of prey, who are not liable to be thus destroyed, increase very slowly.

C H A P. VI.

IT is not at all necessary, convenient, or possible, that a whole civil society, or commonwealth, should be learned, greatly knowing, or experienced : it is necessary, indeed, that such as are intended for the study and practice of deep sciences, should be taught several of the dead languages, the better to enable them to join the knowledge and experience of past ages and distant countries to that of their own. Politicians, priests, physicians, lawyers, historians, &c. cannot be in any degree perfect, without the fund of science preserved in ancient authors. The mercantile part of society, of the superior class, need not be at the pains, unless they chuse it, to acquire any of the dead languages ; but three or four of the living languages of Europe will be necessary to fit them for an extensive traffic, and raise them to the high fortune and reputation in which they stand amongst us ; for, I believe, it may as justly be said, that our
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merchants are princes, as it could have been said of any merchants in ancient times. The like accomplishments may assist many of the middling order of tradesmen. But, as to the lower class of trades, such as handicrafts, farmers, mechanics, &c. their mother-tongue is sufficient for all their purposes ; but it is necessary that they should read their own language, and acquire such a knowledge of figures as may enable them to keep common accounts. As to the lowest class, such as common labourers, peasants, and that part of the people called the poor, it is not needful that they should have any sort of learning, except what may instruct and forward them in their various labours : it is sufficient that they are instructed in the moral and religious rights of their country, by persons whom the policy of the state, under which they live, has appointed for that purpose. Thus would the orders of men be kept distinct, and labouring people would not be wanting to perform the lowest offices in society. A wrong policy prevails with us at present under the name of charity. Our middling people, through a short sightedness, give education to the children

of the lowest class, above what the employments they ought to be bred up to can require: this robs the public of labouring people, and sets these children upon an equality with those of their benefactors, which must consequently hurt the benefactors children, by increasing the number of their order; for many of these children of the poor, when thus educated, will, in the rising generation, out-strip, circumvent, and displace the children of their benefactors, at a time when few of the benefactors themselves are living to see the consequences of their mistaken charity. To support the poor in times of necessity, and to instruct and train their children in a habit of industrious labour, is real charity; and its consequences tend to the good of society. Men of great estates, I think, should be educated in proportion to their fortunes, and above those of the middling people; because out of such are generally chosen the governors and directors of states, as well as those who act as magistrates in their separate divisions; such ought to have knowledge and experience above that of the bulk of mankind whom they are designed to govern. As to gentlemen who have
made

made the chase their sole pleasure, and design to breed their sons to the same occupation, it is needless that they should have a better education than that of their tenants, the farmers, who are generally their companions ; for it requires very little knowledge to enable a man to break his neck in the pursuit of deer, hares, foxes, &c. and in leaping over hedges, ditches and gates.

As I have no design to publish any thing more in Natural History, these essays being chiefly extracts from my great work in seven volumes in quarto *, my petition to God (if petitions to God

* Mr. EDWARDS's Address to the Public on the Sale of his Works to Mr. ROBSON.

College of Physicians, Warwick-Lane, May 1, 1769.

To the Nobility, Gentry, and Curious in general.

HAVING this day sold and delivered to Mr. JAMES ROBSON, book-seller in New Bond-street, all the remaining copies of my Natural History of Birds, and other rare and undescribed Animals, Quadrupeds, Reptiles, Fishes, &c. &c. in seven volumes quarto, French and English, printed upon a fine royal paper, containing six hundred distinct subjects, engraved upon three hundred and sixty-five copper plates, from designs copied immediately from nature, and coloured under my own inspection ; together with all my copper plates, letter-press, and every article in my possession relative to it : I have thought it a duty incumbent upon me, in justice to the public, as well as the purchaser, to declare that all future publications of the said natural history are the sole right and

God are not presumptuous) is, that he would remove from me all desire of pursuing Natural History, or any other study, and inspire me with as much knowledge of his Divine Nature as my imperfect state is capable of ; that I may conduct myself, for the remainder of my days, in a manner the most agreeable to his will, which must consequently be most happy to myself. What my condition may be in futurity is known only to the Wise Disposer of all things : yet my present desires are (perhaps vain and inconsistent

property of Mr. ROXSON : and that my labours may be handed down to posterity with integrity, truth, and exactness, I have delivered into his hands a complete set of the plates, highly coloured by myself, as a standard to those artists who may be employed in colouring them for the future.

As the remainder of my life will be chiefly spent in retirement, I beg leave to return my most grateful acknowledgments to the nobility, gentry, and public in general, for all their favours, and generous support, during the tedious period of all my publications ; and am with the greatest truth and respect,

Their faithful and obliged

Humble servant,

GEO. EDWARDS.

††† The public may always depend upon having of Mr. ROXSON, Mr. EDWARDS's Natural History, 7 vols quarto, carefully coloured, at the usual price of fourteen guineas half bound, or at a proportionable price in any elegant binding.

with

with the nature of things !) that I may become an intelligent spirit, void of gross matter, gravity and levity, endowed with a voluntary motive power; either to pierce infinitely into boundless æthereal space, or into solid bodies ; to see and know how the parts of the great universe are connected with each other, and by what amazing mechanism they are put and kept in regular and perpetual motion. But, oh vain and daring presumption of thought ! I most humbly submit my future existence to the supreme will of the One Omnipotent.

If men, in the present age, at the conclusion of their poetical, historical, or other works, should vaunt and promise themselves immortality, as many of the ancients seem to have done, I believe it would only serve to render them ridiculous, and depreciate rather than enhance the value of their performances : nor can I believe that the ancients were openly so vain or self-conceited, as to promise themselves immortality in such a glaring manner ; but I rather imagine, that those vain flourishes were added by their enthusiastic admirers, in the copies that were made

made after the death of the authors. Our incomparable Shakespear was far from expecting an immortal name: witness the following quotation from his works:

The cloud-cap't tow'rs,
The gorgeous palaces,
The solemn temples,
The great globe itself,
Yea, all which it inherit,
Shall dissolve;
And, like the baseless fabric of a vision,
Leave not a wreck behind.

What may be the future fate of my NATURAL HISTORY, I cannot pretend to judge: but conscious of having endeavoured to become a useful member of society, I submit it to the critics, correctors, translators, regravers; and lastly, if it deserves no better fate, to obscurity and utter oblivion.

ESSAY

ESSAY II.

ON NATURAL HISTORY; AND CHIEFLY ORNITHOLOGY.

CHAP. I.

NATURAL History cannot, in any degree, be perfect without figures; therefore I think we should promote drawing in all such young people who seem to have a liking to it; no one need think it an amusement beneath his dignity, since our present royal family, and many of the young nobility, have been instructed in that art. Every one who consults ancient authors is very sensible of their deficiencies in the want of figures; for many things are mentioned by a bare name, without any description or figure; and great physical
virtues

virtues, and other uses, are attributed to some of these things ; but there being no certain marks to shew what things in nature were called by those names, we have now wholly lost them, or take different things for them, or are in dispute about them ; therefore authors, naturalists especially, should consult, first of all, the outward forms of things, in order farther to explain them by descriptions and other marks ; and deliver them down to posterity, so as to free them, as far as human reason is capable of, from the losses and injuries they may sustain from time. In describing natural things nothing ought to be omitted that is any way remarkable ; and may fix and establish the character of the thing described, so as plainly to distinguish it from all other things : this may be done without following the minute steps of some authors, who have wrote large books on single birds or plants ; for long descriptions lead the mind into mazes and confusion, and tire rather than instruct. On the other hand, too brief descriptions should be avoided ; for very often these are found to consist only of such general forms and colourings that are common to many things of the same genus

genus with the thing so briefly described, which makes the description uncertain, or rather no natural description at all. If naturalists would observe this medium, and study a plain comprehensive language, and well expressing the things treated of, they might gradually, by making the study both useful and pleasant, bring many into the love of natural history who now despise it.

I know there are some gentlemen that put the terms of mean and little upon such sciences or studies that they themselves have no taste for ; and others would make them useless by calling them mere speculations. Natural history has been particularly aspersed and treated in this manner by the enemies to all real knowledge, their ideas, or conceptions, reaching only to such objects and pursuits as produce immediate profit or sensual pleasure : but if these gentlemen will look back a little, they will find that men as great, as wise, and magnanimous, at least, as themselves, in all ages, have busied themselves in the discoveries and knowledge of nature. King Solomon is a great example in this matter, who was himself a natural historian, and perhaps had penetrated

netrated farther into nature than any one has done since. Alexander the Great was remarkable for encouraging all the fine arts, as well natural history as other literature, without which his memory could not have subsisted till this time. But to come nearer our own times, Lewis XIV. of France, though one of the greatest princes of the age he lived in, and engaged in several wars for a considerable part of his life, yet found time to improve his mind by the study of the fine arts, and established an academy for the farther improvement of arts and new discoveries in nature : he was such a lover of the productions of nature, that he made gardens, and built magnificent stoves, &c. for the reception and raising of all exotic plants ; and built at Versailles, near his palace, an elegant and curious place called the *Managery*, with large apartments and conveniencies for living animals from all parts of the world ; and not only rare pictures and sculptures of the greatest masters were collected in his cabinets, but several extraordinary productions of nature. Augustus the late king of Poland was also a great encourager of natural knowledge, and had

had made a large collection of natural productions from most parts of the world.—To come still nearer, even to our own times, his present majesty king George III. has, with a liberality and munificence equal to the Augustan age, become the patron and enourager of the sciences and arts; and generously founded and endowed an academy of drawing, painting, architecture and sculpture. The numerous and noble collection of paintings, manuscripts, and books in all languages and sciences, (but particularly in natural history) together with all kinds of natural and artificial rarities and curiosities collected by his majesty from all parts of the world, in the course of a few years, will deservedly rank the king of Great-Britain's cabinet with that of the greatest princes of Europe.

They who draw after nature, on account of natural history, should represent things justly, and according to Nature, and not strive to exalt or raise her above herself; for by so doing, instead of instructing, they will lead the world into errors; nor can the works of two authors

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on the same subject ever agree. The historical painter, especially he who would represent the fictions of the poets, may take greater liberties, and study by all methods to elevate his subject by adding the highest strokes of art, in order to please the eye, and raise in the mind ideas equal to the historian or poet he would represent : yet every one who reads natural history, and sees figures and descriptions of things in nature, supposes they are, or ought to have been immediately drawn and described from nature. But no experienced man, when he beholds an historical piece, supposes the figures there drawn are like to those they are intended to represent either in feature or person, any farther than in general the historian or poet may have told us, that one man was a graceful person, another a little crooked or deformed ; which accidents a painter has liberty to carry to what degree of perfection or imperfection he can conceive, provided always he doth not contradict the letter of his historian. But in drawing after nature, a most religious and scrupulous strictness is to be observed ; and by this means only we can demonstrate, that nature is or is not the same through

through all times. If natural historians, or they who draw for them, would carefully observe these rules, some of them might, perhaps, produce figures that would be deemed perfect by the knowing naturalists of these times, and escape their censure; then might they, like the celebrated statues of the ancient Greeks and Romans, pass down as models to future ages, as things justly and truly representing nature; but these things are rather to be wished for than expected.

I have been as perfect in my Natural History as the nature of the thing will admit of, in order that it may be added to a new general Ornithology (which, I think, is wanting) in case any one fit for the task should undertake it. It may not be here improper to give my thoughts on that subject, the study of which has lain dormant for many years: I know no English author who has wrote any thing considerable since Mr. Ray revised *Willoughby's* manuscript History of Birds, which was published anno 1678, till of later years Mr. Ray hath added some few, which see in his *Synopsis Method. Avium*, &c. where

where he has mentioned the authors from whom he collected them. The Memoirs of the Academy Royal of Paris, on such an occasion, ought also to be consulted, where something new may be collected. Mr. *Catesby*, in his History of Carolina, &c. hath figured and described upwards of a hundred rare birds, the greatest part of which would come into a new history, being mostly non-descripts. *Albin* hath published a great many, I think upwards of 300 figures; but, they being chiefly collected from *Willoughby*, a compiler must look cautiously on him; what new birds he has worthy of any notice are from Mr. *Dandridge's* collection, the originals of which I have seen, and could wish *Albin's* copies after them had been better; for what is well done after nature itself will be always valuable. *Albin* has given some draughts of birds, which, he says, were from Sir *Thomas Lowther's* collection; but I am very doubtful as to them, they being taken from drawings done by some very mean performer, which *Albin* has not thought proper to confess. By accident I happened to meet with some of these drawings, which has confirmed me in the truth of what I say. The natural
histories

Histories we have had in England, till of late years, are mostly translations from other languages, which has rendered the understanding of them somewhat difficult; for I believe it altogether impracticable to make a translation run so smooth and intelligible as the original from which one translates, without losing a good deal of the true sense and meaning of its author. This we daily discover in translators, who are forced, in some particular parts, to give the words of the first author in the margin, because they cannot be intelligibly rendered in the language of the translator; so that being in its original language is always an advantage to a book, because translations must necessarily, at least in some small degree, give the readers of them different ideas from the originals. My Natural History hath the advantage to be original in its figures, as well as its descriptions; not one of the former being copied from others, or the latter either translated or transcribed.

We are much deceived by people who shew foreign birds and beasts; for they, to make them seem more rare, often pretend them to be

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natives of places very distant and unknown, by which, not only the ignorant, but sometimes the more knowing, are deceived ; and, to strike us with surprise, they pretend that to be a fierce, savage and untameable creature, which in its real nature is very gentle and harmless. From such impositions proceeds the vulgar opinion, that the porcupine is a fierce beast, and that it can kill by shooting its quills, though indeed he is a beast of the more gentle and harmless kind. I believe there are few observing people, that are any way curious, but must have detected some of their cheats. Many African birds have got the name of Americans amongst us, because they generally come to us from the West-Indies ; they being first brought thither from Africa in ships, which trade in Negroe slaves, and presented by captains to governors and planters in America, from whom they are often sent into England as presents to the nobility and our London merchants, without mentioning their being natives of Africa, by which mistake many birds are asserted to be natives of countries where they were not bred. Therefore, since it is not always possible to gain such full
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and perfect accounts as one could wish, I think no man should be discouraged from publishing accounts of natural things, because he cannot give so full an account of them as he desireth ; for it is enough in a faithful author, if he can give but a tolerable account of things which we have not heard of before, or a clearer history of things we have yet known but obscurely, which may give a later searcher opportunity to discover things more perfectly ; for it is altogether impossible in many cases, at first, to come to the knowledge of things in all their particular circumstances. It is the work of some only to hint to us what there is in nature, barely by names ; and of others, to search a little farther, and give some tolerable account of them, which may enable others, who come after, to attain a more perfect knowledge of things, who, perhaps, would never have busied themselves about them, had they not received their first hints from authors far more dark than themselves. In natural productions we often meet with rare things brought from distant parts of the world, which have lain in obscurity, unregarded by any knowing person, till it is for-

gotten from whence they were produced : when such things are discovered, I think it better to preserve figures and descriptions of them, than to let them sink in oblivion, to which they were hastening ; because, when we certainly know that these things subsist in nature, the curiosity of some will be incited to inquire after them, in order to make more full and perfect discoveries. Sir *Francis Bacon* has left us something in his *Advancement of Learning*, pointing out the means of improving science (which is, I think, suitable to our present argument) in the following lines : “ Those things are to be held possible, which may be done by some person, though not by every one ; and which may be done by many, though not by any one ; and which may be done in succession of ages, though not within the hour-glass of one man’s life ; and which may be done by public designation, though not by private endeavour.”

One is somewhat constrained in Natural History, having only one figure of each species, to keep to such attitudes in figures as will shew all their principal parts and colours treated of ;
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otherwise the figures and descriptions together would not be so agreeable to some readers. Therefore many such actions, turns, and fore-shortenings, which make up the agreeable variety of masterly compositions, must be avoided, lest they hide what is most conspicuous in the natural descriptions.

In colouring after nature one should be careful that the lights be not made too light, especially where subjects are of dark colours, because it may deceive those whom we design to inform, by making them believe those subjects are lighter coloured than they really are in nature ; every indifferent judge not considering that an artist cannot express the fullness of light and shadow in a picture, as they appear in natural objects : For example, what man can express the fullness of a shadow in an object that is wholly black ; for the paper or canvass the object is drawn on, must be exposed to a good light to shew it advantageously to the eye, by which means the blackest shadow one can make will appear as light as the highest light of the same black object placed in the same degree of light ;

light; so that we are constrained to raise our lights in such objects something above their appearance in nature, otherwise all would be flat; for as we cannot make the shadows so dark as they appear in nature (shadows in painting being exposed to a strong light) so consequently our lights must be lighter than they appear in nature, that there may be the same proportion between light and shadow in pictures as there is in natural objects; but an excess of light ought to be avoided, otherwise in painting a black object, we may give the beholder rather an idea of grey. In painting objects perfectly white, you have not the advantage of raising your lights above what your natural object presents, so that in pictures there cannot be so great a difference between dark and light objects, as in natural bodies: this way of reasoning in relation to painting might be carried to a great length. I formerly imagined it possible, by the highest perfection in the art of painting, to deceive the eye, by performing what might be taken for nature; but, since I hit on the above reasons, I plainly discover it to be impracticable. I have observed, that rude scene paintings in theatres

theatres are more deceptive than more finished works ; but this proceeds from the distance and lamp light in which we view them.

It is observable, that there are birds peculiar to some particular tracts of land, which will not propagate or spread themselves into other countries, though in the same latitude, and on the same island, by which they might very easily extend themselves, if one particular place had not something in it, unknown to us, which causes them to continue where they are. To instance one amongst many, by way of example : the *Cornish Chough*, or *Ceracias* of *Al-drovand*, is said by Mr. *Willoughby*, in his *Ornithology*, to breed on the clefts and rocks of Cornwall, and on the coasts of Wales, and all the western coasts of England. Yet I cannot learn that there are any of them on the southern coasts of England to the eastward of Devonshire, nor on any part of the eastern coasts ; though these are in parallel latitudes to the western coasts where these birds abound, and the coasts in many places have clefts and rocks seem-

seemingly as convenient for them to breed in as any on the western coasts of England. I have also observed the hen birds of a great number of species to be of a brown or clay colour, where the cocks of the same species are covered with beautiful feathers of a very great lustre. It is very observable in the *Duck* kind, that the males are most of them remarkable for beautiful colours, and the females, almost all of them, of brownish or earthy colours. We may remark the same thing in many land birds, as the *Peacock*, who is remarkable for shining colours, whereas the hen is of a dirty brown, with little or no lustre. The same difference may be observed between the males and females of all the *Pheasant* kind, and of many other tribes of birds. This difference seems to proceed from a providential design of nature; seeing the hen birds, when they hatch their young, sit on the earth, and are many of them exposed to the open sky, to the view of noxious beasts and birds of prey, which would presently discover them, were they of glaring colours much differing from

from the earth on which they sit ; but by being of an earthy colour, and drawing their heads close to their bodies, they appear like rude clods of earth, and deceive the eyes both of man and beast, by which means they are preserved from destruction.

C H A P.

C H A P. II.

WORKS of Natural History, when truly illuminated, may be considered as a book legible to people of all nations and languages, whether learned or illiterate: real representations of animals, &c. properly delineated and coloured, are characters that all nations are taught by nature to understand; and, in many respects, good figures from nature surpass the best verbal descriptions. In the course of my works I have generally had the advantage of working from real nature, many of my subjects being alive and in high perfection, and others well preserved in order to be imported to us from foreign parts; and, if my figures fall short of nature, as they certainly must, it is not for want of care in me, or proper subjects to work from; but because there is an infinite difference between the Great Creator of natural productions, and the presumptuous weak creature, who dared to essay
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an imitation of the works of the Omnipotent, Sometimes, being for a moment thoughtless of the Great Source of nature, I have vainly fancied my faint imitations of her works in some degree complete; but, on the least recollection, a slow, awful, majestic voice seemed to reprove me thus: Vain and presumptuous wretch! dost thou imagine thy faint endeavours can bear the least comparison with the works of him that created thee and all things?

Amongst animals there are, in respect to their sight and time of action, diurnal, nocturnal, and such as act in the morning and evening twilight. Amongst the first may be placed men and monkeys, from the *Homo Sylvestris* down to the smallest species of monkeys properly so called. Not long since I had a little monkey of St. Jago, who was so very nimble, that, when he got loose in a small room, I could not catch him; but, on shutting the light out of the room, I could take him presently. Birds of the granivorous kind are, I believe, all diurnal: and birds of prey are divided into diurnal and nocturnal; though many of those esteemed diurnal

urnal will prey in the evening and morning twilight, as most of the eagle and hawk kind do. Owls cannot bear the day, and do not fly till the twilight advances towards night; but whether or not they fly in dark nights, I cannot tell. I believe many of the water-fowls to be nocturnal; for herons, bitterns, and some others, are seen on the wing in the morning and evening twilight. Many of the quadrupeds see both in the night and in the day, but the cat kind more remarkably; for they not only range and prey in the night, but delight also to bask in the hot sunshine at noon-day, though their eyes are not formed to bear so strong a light; but nature has given them a power to contract the pupil of the eye in such a manner, that no more light is admitted than what their eyes can bear. The bat is wholly a nocturnal quadruped, never appearing by day. All sorts of cattle that graze in the fields are diurnal, and, in some measure, nocturnal; for they move about and feed in the night. Beasts of prey are, in a stricter sense, nocturnal, because the night is their principal time of seeking their prey; nevertheless, most of them

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occasionally appear and ravage in the day time.

There is a very great difficulty to trace precisely the links of nature's chain in its gradation from animal to vegetable beings. When we come below what men generally esteem animals, and enter upon the polypes and coralline species, we are greatly at a loss, as there are various opinions concerning them amongst the curious of these times, some making them real animals, and others real vegetables. For my own part, I think many of them may be deemed of a middle nature, partaking of both; for, though they seem to adhere by roots, and increase as vegetables do, by shooting forth young polypes from their sides, and by becoming perfect polypes from the divided parts of others, which are marks of vegetation, they have, at the same time, a power to move their parts, and put forth tentacula or arms, with which they catch small insects whereon they feed, thereby shewing they partake of an animal nature. See Mr. Baker on Polypes, and Mr. Ellis on Corallines. Various are the means in
nature

nature by which animals are produced ; some are males and females of the same species ; others are hermaphrodites, each one of the species partaking of both sexes, as do most sorts of snails, &c. Most animals on the land generate by contact ; but many of the female fishes cast their eggs (called hard roe) in the water, when the male fish is near at hand, who shedding his seed (called soft roe) in the water at the same time, it mixes with, and gives life to the eggs, without his touching the female. The whole race of birds increases from eggs, which they sit upon to hatch their young. Quadrupeds that are hairy, all bring forth their young alive ; as do also some few that are scaly, as the Armadilla kind : but all animals of the Lizard kind, whether of the land or water, or frequenting both, from the Crocodile down to the smallest species, lay eggs, which are hatched by the warmth of the sun. Some fishes bring forth their young alive. A remarkable, and, I believe, singular way of generation is observed in a large species of the toad brought from Surinam, whose back is full of small cavities, in each of which is found a young toad ; some of the young
brood

brood are breaking forth from their cells, others remain still covered with a thin membrane, and some of the cells are found empty, at the same time. A good specimen of this toad is preserved in spirits at the British Museum. Vegetables are propagated in various manners: the most general is by seed; but many by cuttings, slips, shoots from their roots, &c. What I have observed to be most singular is the tuft of leaves or crown of the pine-apple (*Ananas*), which, when taken from the fruit, and set in a pot of earth, takes root, and becomes a new plant: and the early red lily, which bears roots at every joint up the stem that supports the flower, these roots fall off in the autumn, strike their fibres into the ground, and will, in two or three years, produce flowers. We know little of the generation of minerals, they being hid from our sight.

Insects not only prey on one another, but they can even catch birds, and devour them. The great spiders of America frequently take Humming Birds in their webs. See *Marianus's History of Insects*. Flies will also destroy sheep and

and other cattle, by laying their eggs on their skins amongst their wool or hair; which eggs produce worms that will eat through their skins, and destroy the beasts, unless prevented by the owner's care. The generation of insects is more various and surprising than that of the other parts of the animal creation: many of them appear and act as different animals, in shapes very unlike each other, though they are identically the same.

In classing of animals there is a very great difficulty. In birds we place the several species of the same genus together; but, when we have done this to the best of our abilities, we are doubtful which genus to prefer to the first place, and so on to the last; for, I believe, no two men, who had not consulted others, would place them in the same order. The like may be said of quadrupeds, fishes, and the whole tribe of lesser animals. It appears, at first view, as if quadrupeds gradually declined into birds: for the bat seems to have extended wings, and actually flies; and the gerbo hops like a bird on its hinder legs, never using its fore paws or hands

hands in its progressive motion, which is an action that belongs to birds: yet, on a strict examination, neither of these animals have any relation at all to birds; for they bring forth their young alive, they nourish them with their milk, they are covered with hair, they have teeth, and, in short, four limbs or legs, as other quadrupeds have. The bat, indeed, has the fingers of its arms or fore legs greatly lengthened, and connected by fine membranes, to enable it to fly in the air: the gerbo has also hands or fore feet, with fingers, in which it holds its food, though it doth not put them to the ground in its progression.

On the other hand, quadrupeds seem to unite with fishes; for it is doubtful whether we should class the several species of the seal kind with the four-footed beasts or fishes: they are hairy, and have teeth like four-footed beasts; but, whether to call their extremities feet or fins, with propriety, I do not know. Amongst birds, the penguins from the Straits of Magellan, and those from the Cape of Good Hope, (see my History of Birds, pl. 49 and 94) are accounted

half fowl and half fish by our seamen ; but, on a strict inquiry, I think, they must hold the place of perfect birds, partaking of no other animal nature : for, though their little wings appear, at first sight, to be scaly fins, yet, on applying magnifying glasses, they plainly discover themselves to be covered with minute feathers, having tubes or quills, shafts and webs, as larger feathers have.

I believe it would be a vain attempt, in the most knowing naturalist, to think of ranging all the productions of nature, animals, vegetables, and minerals, in such a true and natural order, that each particular body should stand precisely in its proper place, between two other bodies that justly and naturally should go before and follow after it. There arise insurmountable difficulties, when we go about to consider what relation any one body or thing bears to another : sometimes, indeed, the chain of connexion may be carried on, in seeming regular links, for a little way ; but we shall find it impossible for human judgment to continue it to any great length.

Mr.

Mr. Brisson, in his Ornithology, published at Paris, A. D. 1760. has given a General History of Birds, both as a compiler and an original author ; and I think it, in general, a very good and useful work : but I find in it, what will happen to every compiler that hath not long and carefully studied the subjects he treats of, viz. frequent repetitions of the same identical species of birds under different names, as they are described by different authors, which by him are described in separate articles, as birds specifically distinct from each other ; by which means, I apprehend, he hath greatly multiplied the species of birds. His Ornithology is now finished, which makes six thick volumes in quarto, with a great number of copper-plates, containing the figures of a great number of new birds, altogether unknown to me. They are engraved with great labour and neatness ; tho' most of them have a stiff air, as if drawn from dried or stuffed birds : but in a work of this nature it is excuseable ; for it cannot be supposed the hired operators had opportunity to see and study the shapes and attitudes of the subjects whilst living. Mr. Brisson has consulted all the authors, whether natural

historians or voyagers, who have wrote any thing on birds, and has collected the names given them by all the authors, in all languages : and I believe his Synonyma are fuller and more extensive than they are in any former author, but these very long Synonyma are very liable to mistakes.

ESSAY III.

OF BIRDS OF PASSAGE, &c.

CHAP. I.

IT would be very proper for all travellers into foreign parts, to take notice of what birds and beasts they find, and at what seasons of the year they find them, and at what times they disappear, and when they appear again; that so we may in time give a tolerable account of the places to which birds and beasts of passage go that are found with us, and in other countries, only at certain seasons of the year. Many may think, perhaps, that there are no beasts of passage, but I have been informed by a person of reputation, who now resides in one of the English forts in Hudson's-Bay, that the deer

deer in that country pass northward in the beginning of winter, and return to the south at the approach of summer ; and that they pass in certain beaten tracts well known to the Indians, as well as the English residing there, who lie in wait for them, and kill great numbers for their skins. This makes the thing more strange, and contrary to our common way of reasoning, than it seems to be in the erroneous account ; but if we consider, that these deer in the winter are cloathed with an exceeding thick covering, which falls off, and leaves them very thinly cloathed in the summer, it will reconcile this account a little to our reason. Arthur Dobbs, Esq; has remarked their passage northward in winter, and southward in summer, in his Account and Natural History of Hudson's-Bay. They are said, by the natives, to pass very far north in the summer, and to return, in the winter, far enough southward to come to a temperate climate. I have in my searches after birds discovered some few, that are found in England at certain seasons, to be found also in Bengal ; and some found in Europe, though not in England, are found also in Bengal : whether they

they continue there all the year, or are only birds of passage, as they are with us, I cannot tell; but it would be worth the observation of any curious Englishman residing in that country; therefore I shall set down their names, viz.

The Greater Redstart,	Merula Saxatilis, Aldrov.
The Witwal,	Icterus, Plinii,
The Wheat-Ear,	Oenanthe or Vitiflora,
The Small-Green-Wren,	Regulus non cristatus,
The House-Swallow,	Hirundo domestica,
The Bee Eater,	Merops,
The Wry-neck,	Lynx or Torquilla.

Of this number the Wheat-Ear, the Green-Wren, the House-Swallow and Wry-neck, are found in England in summer, and all of them in the southern parts of Europe, where I believe they are birds of passage also. All these I have met with in parcels of birds sent from Bengal; and if any person of good observation in India could discover that these birds are absent there while present with us, and present there whilst absent here, it would answer the question, whither and in what manner do these birds pass?

It

It is indeed my opinion, that all those birds, which are seen with us only some part of the year, pass into other countries when they are out of our sight. We are certain some of them must, because they do not breed while they continue with us; these are the Wood-cock, Snipes, Field-fare, Redwing, and some others. These, I believe, go into northern countries to breed. The summer birds of passage also come from more southern countries northward to us, and breed here. Seeing then birds retire from more northern parts to winter with us, why should not tender birds who visit us in summer, and breed here, retire and shelter themselves in southern countries, where they are secure from cold, which they cannot bear, and find such food as is natural to them. But many would make sleepers of them, and say they retire to holes under ground, and in hollow trees, &c. and that they are so fat that they cannot fly far at the times they disappear, ; which fatness I take rather for a providential provision to enable them to take a flight of many days without being quite exhausted and spent. A farther reason

to

to me, that our summer birds who disappear are not sleepers, is, that no such sleeping birds have at any time been found, and all the reports of these things are so uncertain, that no sober man can at all depend on them. Did they really creep into holes as is reported, it would be certainly known, and not remain, as it does, a very doubtful matter ; for why should they not be daily found sleeping, as are Dormice, by woodmen and country people, since many of the supposed sleepers are found awake in much greater numbers. I believe, indeed, that the instinct of these birds is not so absolutely certain, as to prevent them from being sometimes surprised by a very cold wet autumn. In such a case I believe some flocks of Swallows have lost their passage, and have been constrained through weakness to shelter themselves in holes where they have perished.

If travellers would be at a little expence of thought and labour, I believe we might come to some tolerable knowledge in relation to the passage of birds, which is now very obscure to us. In order to forward such knowledge, I shall here
point

point out such authors as have said any thing on that subject, and join to them such little observations as I have made. There was published some years ago, by Mr. Charles Morton, without date, and since republished in the Harleian Miscellany, Vol. II. pag. 558. an ingenious, though I think chimerical, account of the Passage of Birds, which supposes them to go to the moon, or some invisible aerial island fixed above our atmosphere, with some other such like conjectures. Dr. Shaw in his Travels, or Observations on Barbary, &c. has given us some light as to the passage of the Stork, which I shall here borrow from him, pag, 428. “ The Ibis, that
 “ was once known to every family [in Egypt] is
 “ now become exceeding rare, though the want
 “ of it is sufficiently supplied by the Stork;
 “ for, besides a great number of these birds, that
 “ might undoubtedly escape my notice, I saw in
 “ the middle of April [1722] our ship lying
 “ then at anchor under Mount Carmel, three
 “ flights of them, each of which took up more
 “ than three hours in passing by us, extending
 “ themselves at the same time more than half a
 “ mile in breadth; they were then leaving Egypt
 “ (where

“ (where the canals and ponds, that are annually
 “ left by the Nile, were become dry) and direct-
 “ ed themselves towards N. E. It is observed of
 “ the Storks, that for about the space of a fort-
 “ night before they pass from one country to an-
 “ other, they constantly resort together, from all
 “ the circumjacent parts, to a certain plain, and
 “ there forming themselves once every day into
 “ a *Dou-wanne* (according to the phrase of the
 “ people) and are said to determine the exact
 “ time of their departure, and the places of their
 “ future abodes. Those that frequent the marshes
 “ of Barbary appear about three weeks sooner
 “ than the flights above-mentioned were observ-
 “ ed to do, though they likewise are supposed to
 “ come from Egypt, whither also they return a
 “ little after the Autumnal Equinox, the Nile
 “ being then retired within its banks, and the
 “ country in a proper disposition to supply them
 “ with nourishment. No less extraordinary are
 “ those flights of Pigeons, that have been ob-
 “ served in New-England, and other parts of
 “ America.” I think what is said by Dr. Shaw
 in the above quotation is sufficient to convince
 any one, that the Stork is a constant inhabitant
 of

of this world, and that it only passes from one part of its superficies to another at certain seasons, the better to accommodate itself with a temperate climate, and proper food. Those that leave Egypt in April, and direct their course north-east, are, I suppose, what appear in Germany, and the Low Countries, all the summer. A north-east direction from Egypt carries them along the coast of Judea, for its whole length; from whence it is likely they go directly north, across Natolia, and pass by the east end of the Black Sea, by which means they have land in view through the course of their whole journey; when they have passed by the Black Sea, the firm lands of Europe and Asia to the north are open before them, so that they may take their course to the places of their destined habitations. I suppose they do not breed in Egypt, since Dr. Shaw hath not mentioned it; but I imagine that all birds of passage go northward to breed, and retire southward toward winter, that is, of such birds as inhabit on this side the Equinoctial Line; for, I suppose, that what birds of passage there are, that continue always to the south of the Equinoctial, go toward the southern Pole in the summer

summer of that part of the world, and retire toward the Equinoctial Line at the approach of their winter. Yet, I believe, the Stork breeds in some parts of the world as far south as Egypt, though perhaps the climate may be cooler, because of its high situation. For le Bruyn, in his Travels into Muscovy, Persia, &c. tells us, that on the tops of the tall pillars in the ruins of Persepolis he observed Storks nests, on some of them one nest, on others two. Those Storks that pass to the northward of the west from Egypt to the northern coasts of Barbary, I suppose breed there, because they continue there all the summer according to Dr. Shaw's account.

I suppose those Storks that visit the northern parts of Barbary never pass over the Mediterranean sea into Spain, or France; because we have no account of their being found there at any time of the year. These countries may be, for some cause unknown to us, not adapted to their nature. I am not of the vulgar opinion, that they avoid these lands, because their governments are monarchical. The Stork is, I believe, the largest bird of passage we have in Europe; it is
known

known by its flight, and taken more notice of than smaller birds of passage. If any knowing persons, who travel, would make particular observations on the smaller kind of birds, when they pass to and from particular countries, I believe we should soon gain a tolerable knowledge in the passage of the smaller birds, and ascertain the places of many of their habitations at all times of the year. To illustrate the history of the Pelican, I shall add a quotation from Dr. Shaw's Supplement to his Travels or Observations, &c. page 89. which is as follows :

“ The *Onocrotalus*, another noted bird of the Nile, is likewise called the Pelican; the remarkable large pouch or bag, that is suspended from the bill of this bird, serves not only as a repository for its food, but as a net likewise wherewithal to catch it; and it may be further observed, that in feeding its young ones (whether this bag be loaded with water or fish) the *Onocrotalus* squeezes the contents of it into their mouths, by strongly compressing it with the bill upon its breast; an action which might well give occasion to the received tradition,

tion, and report, that the Pelican, in feeding
her young, pierced her own breast, and nour-
ished them with her blood."

The reverend Mr. Durand, F. R. S. has
obliged me with an observation on the passage of
birds, which he himself made in Spain, and is
as follows: "I can aver, that being in Spain in
1707, in the kingdom of Valencia, upon the
sea coast, a little way from Castellon de la Plana,
I saw, in October, great flocks of birds com-
ing from Africa, in a direct line from the south;
some of them, being shot, were found to be
Thrushes [Grives], but so dry and lean, that
they had little substance or taste; the people
of the country told me, that they came every
year at the same season in flocks, but that the
greatest part of them go on farther; they grow
fat in Switzerland by feeding on juniper ber-
ries, and are delicious all the winter long."

The above paragraph of Mr. Durand seems
to contradict my opinion relating to the passage
of birds; but though these Thrushes come from
the

the south to the coast of Valencia, I do not think it a certain argument, that they come from Africa ; for to me it seems contrary to reason to imagine, that after birds have lived in the summer heats of Africa, they should go to Spain, and on farther northward, to sustain the cold of a winter, in a country so far north of their summer habitation ; for it is generally believed, that birds pass, in order to attain habitations of near the same temperature with those countries they come from ; now, seeing the sea-coast of Valencia lies north and south, an easterly direction only can bring these birds from the sea. Now, I suppose, that when birds depart from their summer habitations, they gather into great flocks, and have a certain course to direct themselves in ; and that in their greatest rout they may fly so high as to be out of sight ; and, when they have arrived at the place of their winter's habitation, they may separate into lesser flocks, in order to cover some large country ; these lesser flocks may tend to every point of the compass ; after this they may separate, and disperse themselves singly, in order the better to accommodate themselves with food,

and

and scatter themselves all over a country : so that I suppose, the birds Mr. Durand mentions might come from the most northern parts of Europe, and a great part of them in their passage turn a little to the west, through France, and into Spain; and when arrived about Granada, in the south of Spain, might separate into parties, the better to occupy the whole country ; so that part of them might return a little way northward, along the coasts of Murcia and Valencia, and afterwards spread themselves into the inlands. I think this opinion no way contradicts what Mr. Durand has said : what is mentioned of these birds feeding and growing fat in Switzerland doth not belong to this question, for it cannot be known, that they are part of the flocks seen passing on the coast of Valencia.

There was published, anno 1745. in 12mo, A new general History of Birds, with wooden cuts, by J. Osborn in Pater-noster-Row, London ; the author anonymous : in the article of

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the Swallow there are collected several observations on, and accounts of, the passage of birds, from good authors *.

Dr. Shaw, in his fore-mentioned work, page 253. says, "the Woodcock makes its first appearance in October, and continueth till March following: the Africans call it [*Hamel Hadel*] the Afs of the Partridges." Since no account tells us where the Woodcocks go in summer, I am of opinion that they retire to the northern and unfrequented parts of the world to breed. The above account shews, that they spread themselves far southward in the winter.

I have discovered, that there are many birds common both to the old world and America: I saw lately brought from Hudson's-Bay a bird, under the name of a Snow bird, which, they say, is one of the first that appears in the

* See these Observations, page 96.

spring,

spring, while the snow is yet on the ground. On strictly examining this bird, I found it to be the great Pied-Mountain Finch, or Brambling, described in Willoughby's Ornithology, page 255. Besides this, I have received from North-America the Red-Legg'd Horseman, or Totano, described in Willoughby, page 299. the Bald Coot, described page 319. and the Cross-Bill, or Loxia, described page 248. of the same author. These are all birds found in Europe, as well as in America; two of them, viz. the Cross Bill, and the Pied-Mountain Finch, are small land birds. I have also received from America the little bird we call the Golden-Crowned Wren. There are many of the water fowls, that frequent the northern parts of the world, found both in Europe and America; the White Partridge, or *Lagopus Avis*, is found in North-America as well as in Europe. Mr. Catesby, in his History of Carolina, &c. has particularized many birds that he observed to be inhabitants both of America and Europe. I do not wonder to find that birds, who breed on

the sea shores, and make long flights over the sea in the northern parts, should be, indifferently, inhabitants both of the new and old worlds, because we know that toward the North Pole the continents of Europe and America are very near to one another; and may, for aught we know, join near the Pole. We must suppose that these birds have passed from America to Europe, or from Europe to America; or that there were created, at first, birds of the self-same species in both these parts of the world; which, according to my way of reasoning, cannot be supposed. Most of the world agree, that each species sprung from an original single pair. But it seems more easy to conceive how the northern water fowl should inhabit all the northern parts of the world, than to imagine how small land birds, and some greater fowls of short flight, such as the White Partridge, should be able, from one and the same original, to propagate itself in Europe and America. I cannot think these small birds, &c. can spread themselves from

from any part of Europe westward, because we know that there are wide seas between Europe and America, which reach pretty near the North Pole, in countries where few or no land birds are found, even in the summer : therefore I imagine, that they have found a way eastward from Tartary. We cannot indeed say there is a commodious passage that way, since Japan in Asia, and California in America, are the nearest lands to each other that we certainly know of, which, however, are at a very great distance : yet we know not but there may be islands, or extended continent, between these lands, something to the northward, that may join, or nearly join, Asia and America. I think our finding small land birds of the same individual species in both parts of the world, is a probable reason for this opinion. I cannot help thinking, that America was also peopled with the human species from Asia eastward. What has confirmed me in this opinion is a description of the *Samoeds* [man-eaters] to the north-east of Archangel in Russia : see Le Bruyn's

Bruyn's Travels into Muscovy, Persia, &c.
Vol. I. page 6. Le Bruyn was bred a lim-
ner, and has been at the pains to figure a
head of one of the *Samoeds* in large, on a
folio page, which gives every one that has
seen any of the North-American people a per-
fect idea of them.

C H A P.

C H A P. II.

MY good friend, the late Mr. Mark Catesby, I remember, sometime before his death, presented a paper to the Royal Society, relating to the passage of birds, which was read at one of their meetings. This paper I have not by me, but well remember the general opinion advanced in it was, that he imagined such birds as were inhabitants with us only part of the year, departed from hence to inhabit southern countries on the other side of the Equinoctial Line, just of the same degree of latitude with those they departed from on the northern side: such a conjecture, at first sight, seems to be probable enough; because, in general, it is supposed, that during our winter season, the temperature of the weather, in the southern latitudes, is nearly the same as it is with us in our summer; and then of consequence a bird of passage, that passes from sixty degrees of northern, to sixty degrees of southern latitude, will meet not only with the
 same

same altitude of the sun, in both latitudes, provided the passage is made in September or March, but with nearly the same degree of heat. But if we consider, that there are many birds of passage found far to the northward, in seventy degrees of latitude (where, I believe, all the fowls are birds of passage, it not being a climate fit for their subsistence in winter) they must have a long way to pass, according to Mr. Catesby's notion; for seventy degrees to the Equinoctial Line, and seventy degrees again to the south of it, are an hundred and forty degrees, which, at our lowest computation of a degree of latitude, make eight thousand four hundred miles, which is a prodigious flight for a bird to perform in a short time. Birds that are constant inhabitants between the Tropics, it is very likely, may make transits across the Equinoctial, to accommodate themselves with proper food at different seasons, or to avoid the inconveniency of the excessive rains in one place, by seeking the more dry and pleasant seasons in another; but to imagine that birds who inhabit the high latitudes, either of the northern or southern hemispheres, should change their habitations,

tions, from an extreme northern, to an extreme southern latitude, or *vice versa*, is contrary to all reason, and the nature of things; for birds inhabiting frigid, or temperate climates, would find themselves almost out of their proper element, while passing through a tract of more than forty-five degrees of the Torrid Zone, before they could arrive at their natural and cooler climates on the opposite side of the Torrid Zone; nor is there any reason at all for birds to pass from the northern to the southern hemisphere, in order to arrive at a place of a proper and wished-for temperature; for when a bird leaves its northern situation at the approach of winter, and advances southward, he arrives at some place of an equal degree of heat with that of the northern summer from whence he departed, without coming near the Equinoctial Line; so that I see no reason at all to suppose they pass from the north, across the Line, to southern habitations; but I think it most reasonable that they should stop when they have found a resting place in a climate of equal temperature with that from which they departed; for to suppose they go a long voyage across the Line, into far distant

distant southern countries, is only carrying them a long journey to seek what they might find near at hand. We know that the Stork, who inhabits some of the more northern parts of Europe in the summer, retires in the winter no farther than Egypt, about the mouths of the Nile, which is on this side of the Line : but according to Mr. Catesby's opinion, she must retire into some southern *Terra Incognita* ; for we know of no land, on the old-world-side of the globe, of so high a southern latitude as Holland lies north, which is one of the summer habitations of the Stork. There remains something yet more difficult to be cleared up in relation to the passage of some birds ; I mean several of the short-winged water-fowl, that, during the summer months, inhabit the northern islands of Europe ; such as the Danish islands of Farro, and Iceland, and many others farther north, even on the coast of Greenland. Amongst these, the most remarkable for its short wings, is my Northern Penguin, figured in plate 147 of my large work, which is a bird never supposed to be capable of any flight at all, not even so much as to free itself from the water. There are several others with short wings,

wings, and of such short flight, that they cannot fly to the places where they breed, on high rocks, without making several stages, by flying from one ridge to another, and so mounting at last to their nests and roosting places. Amongst these are the Razor-Bill, the Gillemot, and the Coulterneb, which see described by our countryman Willoughby, in his Ornithology, page 123, 4, 5. All these birds, with some others of the same genus, disappear in the winter ; and it is not conceivable that they should take long flights in order to change their situation, especially the Penguin, who certainly cannot fly at all.

It remains now to consider what should become of these birds, during their absence from the sight of the inhabitants of those islands : there must be some providential means to preserve them unseen, in that part of the world where they appear only in the summer months ; for in the spring they are said to appear all at once, in as great numbers as if they had never been absent. I think the most rational conjecture, for the manner of their hiding themselves, and being preserved during the long and cold

cold winters of those climates, is, that there are sub-marine caverns in the rocky shores of those islands; the mouths of which caverns, though they be under water, may lead to hollows, so rising within side as to afford a convenient dry harbour, fit to preserve these birds in a kind of torpid state during the winter. The sea lying before the mouths of such caverns, and they having a vast depth of mountain over them, their inward capacity must be defended from any rigid cold, which may be a means to preserve these fowls; and late in the Spring (about May) the time of the appearance of these birds, the outward warmth of the air, and the returning strong sun beams on the water, near the mouth of the cavern, may, by a small degree of heat and light, re-animate, as it were, these animals, and bring them from their state of forgetfulness, by degrees, to the use of life and motion, till at last they are emboldened to launch forth for another summer, seek their prey in the ocean, and propagate their species on the neighbouring rocks.

It

It is supposed by many, that there are lands to the northward of the great mother of seas, the Pacific Ocean, and that they connect the western parts of North America with the eastern limits of Tartary. These lands cannot conveniently breed any birds but such as inhabit them all the year ; because there are no lands to the southward of them for birds of passage to pass unto : so that, if there be any, they must make long journeys to the east or west, before they can find land more south, and in a warmer latitude than what they must leave behind them. I think it reasonable to believe, that many birds, which are constant inhabitants of warm countries, pass from one warm country to another, on account of the great rains which fall very heavily at certain seasons of the year, and continue without intermission for several months together ; while countries very near, perhaps separated only by a ridge of mountains, enjoy a dry serene season. Numberless such instances are given by voyagers : so that birds may easily take the advantage of it ; for it is not easy to conceive
how

how fine-feathered land-birds can subsist during a three-months heavy rain.

Mr. Clineus says, that the Sand-Martins, or Shore-Birds, continue in their holes all the winter: but Mr. Colinson, of London, F. R. S. has examined into that matter, this present month (October 1757) after the Sand-Martins had wholly disappeared, by desiring a clergyman, his particular friend, in Surry, who lived near a convenient spot for the experiment, to open a place where a great number of Sand-Martins had been observed to build their nests in the foregoing summer. The earth was accordingly opened near the edge of a pit where many of their holes were made; and, on digging down to them, no birds were found; though the nests were found perfect, in some of which were found corrupted white eggs, and in others some flies, of the Bee kind, had taken shelter. To be the more certain, the passages into the nests, which were about a foot and a half in length, little more or less, were quite free of any lodgments of birds;

birds ; and, upon search, were found to be open and empty. Many of the holes were examined, and traced to their utmost extent, and no birds were found in them.

I humbly beg pardon for troubling the reader with conjectures so new and uncommon ; but, as I cannot solve the disappearance of these birds any other way, I hope the hint may put some person, of a more acute penetration, upon searching out the true place of their winter habitation, or at least produce some more probable conjecture. It is the opinion of several very curious and learned gentlemen, that several of our English small birds, which disappear in the winter, do not pass the seas into foreign countries, but that they hide themselves in holes and caverns, where they lie torpid all the winter. The reason they give for it is, that they become so fat in the autumn, at the time of their disappearing, that they can make but very short flights : and this fatness is supposed to supply and nourish them during the winter. But this opinion will not,

I be-

I believe, hold good in all small birds; for I take it to be manifest beyond dispute, that the Swallow-kind leave this island in the autumn.

Having, in page 81, mentioned A new general History of Birds, wherein are collected several opinions on the passage of birds, I shall here, and in the following chapter, give an abstract of them, as that book is but little known.

“ The migration of birds is no less wonderful than any other particular which has been mentioned. This is common to various kinds of them, as the Swallow, Quail, Stork, Crane, Fieldfare, Woodcock, Martin, Nightingale, &c. Mr. Derham has produced what is observed by the prophet, as a remarkable instance of instinct, “ That the Stork in the heavens knoweth her appointed times, and the Turtle, and the Crane, and the Swallow, observe the time of their coming.”

“ This, says Mr. Chambers, is a curious article in natural history, and furnishes a notable instance

stance of a powerful instinct impressed by the Creator. It is strange that these unthinking creatures should know the most proper times for their passage, when to come, and when to go.

—No doubt but the temperature of the air, as to heat and cold, and their natural propensity to breed their young, are the great incentives to these creatures to change their habitation ; but yet, that they should comply with these incentives, and annually shift their habitation at all, is wonderful.

“ Again, that they should know what way to steer their course, and whither to go, is somewhat amazing to consider. What instinct is it that moves a poor foolish bird to venture over vast tracts of land, and especially cross large seas, in quest of fresh and farther conveniences ? If it be said, that by their high ascents into the air, they can see across the seas, yet what should teach or persuade them that that land is more proper for the purpose of breeding and feeding than this ? that Britain, for instance, should afford them better accommodation than Egypt, than the Cana-

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rics,

rica, than Spain, or any other of the intermediate countries ?

“It is farther observable, that birds in their migration discover wonderful order and polity : they fly in troops, and steer their course through huge unknown regions without the compass. — Add to this, that the birds of passage are all peculiarly accommodated by the structure of their parts for long flights.

“ Whither these birds go, or where they have their abode while absent from us, is an inquiry I can find little satisfaction in.”

CHAR.

C H A P. III.

THE learned and ingenious differ so widely in their accounts with relation to the places where these birds go, it may afford the curious reader no disagreeable entertainment to give him their various sentiments on the subject.

Dr. Derham remarks, " Swifts and Swallows have remarkably short legs, especially the former, and their toes grasp any thing very strongly : all which is useful to them in building their nests, and other such occasions as necessitate them to hang frequently by their heels. But there is far greater use of this structure of their legs and feet, if the reports be true of their hanging by the heels in great clusters (after the manner of Bees) in mines and grottos, and on the rocks by the sea, all the winter. Of which latter, I remember the learned Dr. Fry told this story

at the University, and confirmed it to me since, viz. That an ancient fisherman, accounted an honest man, being near some rocks on the coast of Cornwall, saw, at a very low ebb, a black list of something adhering to the rock, which when he came to examine, he found it was a great number of Swallows ; and, if I misremember not, of Swifts also, hanging by the feet to one another, as Bees do ; which were covered commonly by the sea-waters, but revived in his warm hand, and by the fire. All this the fisherman himself assured the doctor of.

“ The same ingenious author farther remarks, that it is Mr. Willoughby’s opinion, Swallows fly into Egypt, Ethiopia, &c. but Olaus Magnus, Etmuller, and some modern travellers, he says, put this matter quite out of doubt.

“ He then gives the relation of Dr. Colas, as follows :

“ We had, at a meeting of the Royal Society Feb. 12, 1712-13, a farther confirmation of Swallows retiring under water in winter from Dr. Colas, a person very curious in these matters ;

ters ; who, speaking of their way of fishing in the northern parts, by breaking holes, and drawing their nets under the ice, saith, that he saw sixteen Swallows so drawn out of the Lake of Samrodt, and about thirty out of the king's great pond in Rosineilen ; and that at Schlebitten, near an house of the Earl of Dobna, he saw two Swallows just come out of the waters, that could scarce stand, being very wet and weak, with their wings hanging on the ground ; and that he hath observed the Swallows to be often weak for some days after their appearance.

“ The ingenious Dr. Owen, in his History of Serpents, speaking of Woodcocks and Field-fares visiting us in the winter, and then returning northwards, says, “ But as to Cuckows and Swallows, it is generally allowed that they sleep in winter, having, as it is said, been found in hollow trees and caverns. Nor is this at all unlikely ; though, on the other hand, I can see no absurdity in supposing that these should go upon a summer, as the others do upon a winter pilgrimage ; that these pursue a lesser heat, as well as the others fly from a greater cold.

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“ De O valle observes, that the Swallows come into Chili in the summer, and go away against the winter into warmer climates, as they do with us in Europe.

“ The following account may be found in the Tour through Great Britain ; where, speaking of the towns of Southwold, Ipswich, and some others in the eastern parts of the kingdom, the author has the following remarks : “ At this town in particular, and so at all the towns on this coast, from Orford-Nefs to Yarmouth, is the ordinary place where our summer friends, the Swallows, first land when they come to visit us ; and here they may be said to begin their flight, when they go back into warmer climates. I was some years before at this place, about the beginning of October ; and lodging in a house that looked into the church-yard, I observed in the evening an unusual multitude of Swallows sitting on the leads of the church, and covering the tops of several houses round about : this led me to inquire of a grave gentleman, whom I saw near me, what the meaning was of such a prodigious multitude of Swallows sitting there ; O, Sir, says he,

he, turning towards the sea, you may see the reason, the wind is off sea ; for this is the season of the year when the Swallows, their food failing here, begin to leave us, and return to the country, wherever it be, from whence I suppose they came ; and this being the nearest land to the opposite coast, and the wind contrary, they are waiting for a gale, and may be said to be wind bound,

“ This was more evident to me, when in the morning I found the wind had come about to the north-west in the night, and there was not one Swallow to be seen.

“ Certain it is, that the Swallows neither come hither merely for warm weather, nor retire merely from cold ; they, like the shoals of fish in the sea, pursue their prey ; they are voracious creatures, and feed flying ; for their food is the insects, of which, in our summer evenings, in damp and moist places, the air is full. They come hither in the summer, because our air is fuller of fogs and damps than in other countries ; and for that reason breeds great quantities of insects. If
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the air be hot and dry, the gnats die of themselves, and even the Swallows will be found famished for want, and fall down dead out of the air, their food being taken from them. In like manner, when cold weather comes in, the insects all die ; and then of necessity the Swallows quit us, and follow their food wherever they go. This they do in the manner I have mentioned above ; for sometimes they are seen to go off in vast flights like a cloud ; and sometimes again, when the winds grow fair, they go away a few and a few, as they come, not staying at all upon the coast.

“ This passing and repassing of the Swallows is observed no-where so much, that I have heard of, as on this eastern coast ; namely, from above Harwich to the east point of Norfolk, called Winterton-Ness, north ; which is all right against Holland. We know nothing of them any farther north, the passage of the sea being, as I suppose, too broad from Flamborough Head, and the shore of Holderness in Yorkshire, &c.”

To

To the foregoing accounts, we shall give an abstract from Mr. Penant's valuable work intitled British Zoology, under the article Swallow.

“ There are three opinions among naturalists concerning the manner the Swallow tribes dispose of themselves after their disappearance from the countries in which they make their summer residence. Herodotus mentions one species that resides in Egypt the whole year : Prosper Alpinus asserts the same ; and Mr. Loten, late governor of Ceylon, assured us, that those of Java never remove. These excepted, every other known kind observe a periodical migration, or retreat. The Swallows of the cold Norway, and of North America, of the distant Kamtschatka, of the temperate parts of Europe, of Aleppo, and of the hot Jamaica, all agree in this one point.

“ In cold countries, a defect of insect food, on the approach of winter, is a sufficient reason for these birds to quit them : but since the same cause probably does not subsist in the warm climates,

mates, recourse should be had to some other reason for their vanishing.

“ Of the three opinions, the first has the utmost appearance of probability ; which is, that they remove nearer the sun, where they can find a continuance of their natural diet, and a temperature of air suiting their constitutions. That this is the case with some species of European Swallows, has been proved beyond contradiction. We often observe them collected in flocks innumerable, on churches, on rocks, and on trees, previous to their departure hence ; and Mr. Collinson proves their return here in perhaps equal numbers, by two curious relations of undoubted credit : the one communicated to him by Mr. Wright, master of a ship ; the other by the late Sir Charles Wager, who both described (to the same purpose) what happened to each in their voyages. “ Returning home, says Sir Charles, “ in the spring of the year, as I came into sounding in our channel, a great flock of Swallows “ came and settled on all my rigging ; every “ rope was covered ; they hung on one another “ like

“ like a swarm of Bees ; the decks and carving
 “ were filled with them. They seemed almost
 “ famished and spent, and were only feathers
 “ and bones ; but being recruited with a night’s
 “ rest, took their flight in the morning.” This
 vast fatigue proves that their journey must have
 been very great, considering the amazing swift-
 ness of these birds : in all probability they had
 crossed the Atlantic ocean, and were returning
 from the shores of Senegal, or other parts of
 Africa ; so that this account, from that most able
 and honest seaman, confirms the later information
 of M. Adanson.

“ The second notion has great antiquity on its
 side. Aristotle and Pliny give as their belief,
 that Swallows do not remove very far from their
 summer habitation, but winter in the hollows of
 rocks, and during that time lose their feathers.
 The former part of their opinion has been adopt-
 ed by several ingenious men ; and of late sever-
 al proofs having been brought, at least, of some
 species having been discovered in a torpid state.
 Mr. Collinson favoured us with the evidence of
 three gentlemen, eye-witnesses to numbers of
 Sand

Sand Martins being drawn out of a cliff on the Rhine, in the month of March 1762. And the honourable Mr. Daines Barrington, this year, communicated to us the following fact, on the authority of the late Lord Belhaven, that numbers of Swallows have been found in old dry walls, and in sand-hills near his lordship's seat in East Lothian; not once only, but from year to year; and that when they were exposed to the warmth of a fire, they revived. We have also heard of the same annual discoveries near Morpeth in Northumberland, but cannot speak of them with the same assurance as the two former: neither in the two last instances are we certain of the particular species.

“ The above are circumstances we cannot but assent to, though seemingly contradictory to the common course of nature in regard to other birds. We must, therefore, divide our belief relating to these two so different opinions, and conclude, that one part of the Swallow tribe migrate, and that others have their winter quarters near home. If it should be demanded, why Swallows alone are found in a torpid state, and not the
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the other many species of soft billed birds, which likewise disappear about the same time? The following reason may be assigned :

“ No birds are so much on the wing as Swallows ; none fly with such swiftness and rapidity ; none are obliged to such sudden and various evolutions in their flight ; none are at such pains to take their prey ; and we may add, none exert their voice more incessantly ; all these occasion a vast expence of strength, and of spirits, and may give such a texture to the blood, that other animals cannot experience ; and so dispose, or, we may say, necessitate, this tribe of birds, or part of them, at least, to a repose more lasting than that of any others.

“ The third notion is, even at first sight, too amazing and unnatural to merit mention, if it was not that some of the learned have been credulous enough to deliver, for fact, what has the strongest appearance of impossibility ; we mean the relation of Swallows passing the winter immersed under ice, at the bottom of lakes, or lodged beneath the water of the sea at the foot
of

of rocks. The first who broached this opinion was Olaus Magnus, archbishop of Upsal, who very gravely informs us, that these birds are often found in clustered masses at the bottom of the northern lakes, mouth to mouth, wing to wing, foot to foot ; and that they creep down the reeds in autumn, to their subaqueous retreats. That when old fishermen discover such a mass, they throw it into the water again ; but when young inexperienced ones take it, they will, by thawing the birds at a fire, bring them indeed to the use of their wings, which will continue but a very short time, owing to premature and forced revival.

“ That the good archbishop did not want credulity, in other instances, appears from this, that after having stocked the bottoms of the lakes with birds, he stores the clouds with mice, which sometimes fall in plentiful showers on Norway, and the neighbouring countries.

“ Some of our own countrymen have given credit to the submerision of Swallows ; and Klein patronises the doctrine strongly, giving the following

lowing history of their manner of retiring; which he received from some countrymen and others. They asserted, that sometimes the Swallows assembled in numbers on a reed, till it broke and sunk with them to the bottom; and their immersion was preluded by a dirge of a quarter of an hour in length: that others would unite in laying hold of a straw with their bills, and so plunge down in society: others again would form a large mass, by clinging together with their feet, and so commit themselves to the deep.

“Such are the relations given by those that are fond of this opinion; and, though delivered without exaggeration, must provoke a smile. They assign not the smallest reason to account for these birds being able to endure so long a submerſion without being ſuffocated, or without decaying, in an element ſo unnatural to ſo delicate a bird; when we know that the Otter *, the Cormorant, and

* Though entirely ſatisfied in our own mind of the impoſſibility of theſe relations; yet, deſirous of ſtrengthening our opinion with ſome better authority, we applied to that able anatomist,

and the Grebes, soon perish, if caught under ice, or entangled in nets : and it is well known, that those animals will continue much longer under water than any others to whom nature hath denied that particular structure of heart, necessary for a long residence beneath that element."

anatomist, Mr. John Hunter ; who was so obliging to inform us, that he had dissected many Swallows, but found nothing in them different from other birds as to the organs of respiration. That all those animals which he had dissected of the class that sleep during winter, such as lizards, frogs, &c. had a very different conformation as to those organs : that all these animals, he believes, do breathe in their torpid state ; and, as far as his experience reaches, he knows they do : and that therefore he esteems it a very wild opinion that terrestrial animals can remain any long time under water without drowning.

I shall here insert a receipt of the manner of making pictures of birds with their natural feathers.

A RECEIPT

A
R E C E I P T
F O R M A K I N G
P I C T U R E S O F B I R D S,
W I T H T H E I R
N A T U R A L F E A T H E R S.

FIRST, take a thin board, or pannel of deal, or wainscot well seasoned, that it may not shrink, then smoothly paste on white paper, and let it dry; and if the wood casts its colour through, you may paste on a second paper, and it will be whiter: let the second paper dry, then get ready any bird that you would represent, and draw it as exact as may be on your paper'd pannel, of its natural size, (middle-sized birds are best for this work) then paint what
I ground-

ground-work, or tree, or other thing, you design to set your bird on, together with the bill and legs of the bird in water-colours, leaving the bird to be covered with its own natural feathers. You must first prepare the part to be feathered, by laying on pretty thick gum Arabic, dissolved in water, with a large hair pencil; then lay the pannel flat, and let it dry hard, and when dry cover it with your gum-water a second time, and let it dry, and then a third, in case you do not find it lie with a good body on the paper; the thickness of a shilling, when dried hard, is sufficient. When your piece is thus prepared, take the feathers off from your bird, as you use them, beginning always at the tail, and points of the wing, and working upwards to the head; observing to cover that part of your draught with the feather, that you take from the same part in your bird, letting them fall one over another in their natural order. You must prepare your feathers by cutting off the downy part that is about their bottoms; and the larger feathers must have the insides of their shafts shaved off with a knife, to make them lie flat; the quills of the wings must have their inner webs

webs clipped off, that in laying them the gum may hold them by their shafts. When you begin to lay them, take a pair of steel pliers to hold the feathers in; and have some gum-water, not too thin, and a large pencil ready to moisten the gummed ground-work by little and little as you work it; then lay your feathers on the moistened parts, which must not be waterish, but something tacky or clammy to hold the feathers. You should prepare a parcel of small leaden weights, in the form of sugar-loaves, which you may cast in sand, by first making holes in its surface with a pointed stick: these weights will be necessary to set on the feathers you have newly laid on to hold them to the gum, till they are dry and fixed; but you must be cautious lest the gum come through the feathers; for it not only smears them, but dries to the bottoms of the weights, and you will be apt to pull off the feathers with the weights, which will disorder your work. When you have wholly covered your bird with feathers, you must, with a little thick gum, stick on a piece of paper cut round, of the bigness, and in the place of the eye, which you must colour like

the eye of the bird. When the whole is dry, dress the feathers round the out-line that may chance to stare a little, and rectify what may be mended in any other part ; then lay a sheet of clean paper on it, and on that a heavy book, or some such thing, to press it : after which it may be preserved in a frame covered with a glass.

I shall add to this receipt another, that may serve to decorate the former ; which is a way to take the figures of Butterflies on thin gum'd paper, which may be cut out and stuck into other pictures by way of embellishment.

A RECEIPT

TAKE Butterflies, or field Moths, either those caught abroad, or such as are taken in Caterpillars, and nursed in the house till they be Flies, clip off their wings very close to their bodies, and lay them on clean paper, in the form of a Butterfly when flying, then have ready prepared gum Arabic, that hath been some time dissolved in water, and is pretty thick ; if you put a drop of Ox gall into a spoonful of this, it will be better for the use ;

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temper them well with your finger, and spread a little of it on a piece of thin white paper, big enough to take both sides of your Fly; when it begins to be clammy under your finger the paper is in proper order to take the feathers from the wings of the Fly; then lay the gummed side on the wings, and it will take them up; then double your paper so as to have all the wings between the paper; then lay it on a table, pressing it close with your fingers; and you may rub it gently with some smooth hard thing; then open the paper, and take out the wings, which will come forth transparent. The down of the upper and under side of the wings, sticking to the gummed paper, form a just likeness of both sides of the wings in their natural shapes and colours.

The nicety of taking off Flies depends on a just degree of moisture of the gummed paper; for if it be too wet, all will be blotted and confused; and if too dry, your paper will stick so fast together, that it will be torn in separation. When you have opened your gummed papers, and they are dry,
you

you must draw the bodies from the natural ones, and paint them in water-colours. You must take a paper that will bear ink very well for this use ; for a sinking paper will separate with the wet, and spoil all.

ESSAY

ESSAY IV.

CHARACTERS OF EMINENT MEN; WITH A CATALOGUE OF SIR HANS SLOANE'S MUSEUM, AND OTHER NATURAL CURIOSITIES.

CHAP. I.

DURING the time of the publication of my History of Birds, I had the great honour, happiness, and pleasure of being patronized by four gentlemen, who were, perhaps, the greatest promoters of learning, science, and arts, of any in the present age.—The first of these gentlemen was the late Most Noble Duke of Richmond; noble in his lineage and descent from the royal house of these kingdoms, but still

still more noble and great from the innate magnificence, generosity, and goodness of his soul. Though, by his high offices, his time was taken up by the important affairs of the public, yet his doors were always open to men of learning, science, and ingenuity.

The second was the good Sir Hans Sloane, Bart. who employed me, for a great number of years, in drawing miniature figures of animals, &c. after nature, in water-colours, to increase his very great collection of fine drawings by other hands; which drawings are now all fixed in the British Museum, for the help and information of those in future generations, that may be curious or studious in natural history. Sir Hans, in the decline of his life, left London, and retired to his manor-house at Chelsea, where he resided about fourteen years before he died. After his retirement to Chelsea, he requested it as a favour to him, (though I embraced his request as an honour done to myself) that I would visit him every week, in order to divert him, for an hour or two, with the common news of the town, and with any thing particular that should happen amongst his acquaintance of the Royal Society,

Society, and other ingenious gentlemen, many of whom I was weekly conversant with ; and I seldom missed drinking coffee with him on a Saturday, during the whole time of his retirement at Chelsea. He was so infirm as to be wholly confined to his house, except sometimes, though rarely, taking a little air in his garden in a wheeled chair : and this confinement made him very desirous to see any of his old acquaintance to amuse him. During this latter part of his life, he was frequently petitioned for charity by some decayed branches of families of eminent men, late of his acquaintance, who were famous for their learned works, &c. which petitions he always received, and considered with attention ; and, provided they were not found fraudulent, they were always answered by his charitable donations. He has often desired that I would inquire into the merits of such petitioners ; and, if found satisfactory, he commissioned me to convey his bounty to the distressed. —The last time I saw him, I was greatly surprised and concerned to find so good a man in the agonies of death : this was on the tenth day of January 1753, at four o'clock in the afternoon :

noon: he died on the eleventh, at four in the morning. I continued with him later than any one of his relations, but was obliged to retire, his last agonies being beyond what I could bear; though, under his pain and weakness of body, he seemed to retain a great firmness of mind, and resignation to the will of God.

The third of my patrons was the great Richard Mead, M. D. He was certainly magnanimous beyond the common measure, and deserved the title of Great in as extensive a sense as any man in his station could do. He, as well as Sir Hans Sloane, died in the highest stations of physic they could arrive at, viz. Physicians in Ordinary to the King. Dr. Mead, indeed, never was at the head of the College of Physicians of London, but it was because he always absolutely declined it; for he hath been elected into that honourable station, but never could be persuaded to accept of it. His personal service, his ample fortune, his house, and every thing in his power, always contributed, in the most extensive manner, to the promotion of learning, science, arts, mechanics, and, in short, every thing that

that tended to the public benefit and honour of his country, or was of use to particular members of the community he lived in. In short, his generosity was so diffusive, that he may be justly deemed a benefactor to the whole community ; whilst, instead of hoarding up that great wealth his practice gained, to raise a vast estate, as he might easily have done, his public spirit was unconfined, and he was contented to leave behind him a moderate fortune only. The worthy Dr. Askew, from a laudable veneration for the memory and public character of so great a patron of learning, &c. has caused a fine marble bust of him to be made by one of the most eminent sculptors of the present age, which is placed in the College of Physicians, London. And, on this occasion, I cannot help informing succeeding generations, that they may see the real features of Dr. Mead in this said bust ; for I, who was as well acquainted with Dr. Mead's face as any one living, do pronounce this bust of him to be so like, that, as often as I see it, my mind is filled with the strongest idea of the original.

Martin

Martin Folkes, Esq; the last of my deceased principal patrons, was a friend and intimate acquaintance of the other three. He had made the grand tour of Europe, not in the younger part of life, but after his marriage. He travelled with part of his family and servants, at a proper age to make just observations, and gather all the commendable parts of the learning, customs, and manners of the countries through which he passed, in order to refine and polish those of his own. He travelled not in haste, as is the general custom; but proceeded slowly, and spent what time was necessary to inform himself of all that was worth notice: and, indeed, he seemed to have attained to universal knowledge; for, in the many opportunities I have had of being in his company, almost every part of science has happened to be the subject of discourse, all of which he handled as an adept in each. He was a man of great politeness in his manners, free from all pedantry and pride, and, in every respect, the real unaffected fine gentleman.

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The loss of four patrons, so truly noble, so good, so great, and every way so highly accomplished, in the small space of three or four years, was an event that greatly humbled me. I imagined, that, after so great a loss to arts and sciences in general, and to myself in particular, all endeavours to excel in any branch of knowledge would be fruitless, and of little avail to its author, for want of shining patterns to inspire the rising generation; and I thought of discontinuing any farther progress in natural history: but I find, that the national spirit for the promotion of learning and arts, in the establishment of that immense fund of science, the British Museum, has, in some measure, revived the passion for learning and useful knowledge; and I hope these seeds, sown by public authority, cherished and protected by a PRINCE distinguished for virtue and learning, will take root, spring up, and yield a plentiful harvest,

The British Museum reminds me of a brief catalogue of the natural and artificial subjects
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contained in it, which Sir Hans Sloane shewed me about a year before he died, and permitted me to take a copy of; and, as I believe, though it is so very general, it may, for want of a more perfect one, be acceptable to the reader, I shall give it as follows :

An account of the names and numbers of the several species of things contained in the Museum of Sir Hans Sloane, Bart. and which, since his death, are placed for the use of the public in the British Museum.

The library, including books of drawings, manuscripts, and prints, amounting to about } vol. 50000

Medals and coins, ancient and modern	23000
Cameos and intaglios, about	700
Seals, &c.	268
Vessels, &c. of agate, jasper, &c.	542
Antiquities	1125
Precious stones, agates, jaspers, &c.	2256
Metals, minerals, ores, &c.	2725
Crystals, spars, &c.	1864
Fossils, flints, stones, &c.	1275
Earths,	

Earths, sands, salts, &c.	-	1035
Bitumens, sulphurs, ambers, &c.		399
Talcs, micæ, &c.	- -	388
Corals, sponges, &c.	- -	1421
Testacea, or shells, &c.	- -	5843
Echini, echinites, &c.	- -	659
Afteriæ, trochi, entrochi, &c.	-	241
Crustaceæ, crabs, lobsters, &c.	-	363
Stellæ marinæ, star-fishes, &c.	-	173
Fishes, and their parts	-	1555
Birds, and their parts, eggs and nests of different species	}	1172
Quadrupeds, &c.	- -	1886
Vipers, serpents, &c.	- -	521
Insects, &c.	- - -	5439
Vegetables	- -	12506
Hortus siccus, or volumes of dried plants		334
Humana, as calculi, anatomical pre- parations, &c.	} - -	755
Miscellaneous things, natural, &c.		2098
Mathematical instruments	-	55
Pictures and drawings framed	-	471

Every single particular of all the above articles are numbered, and entered by name, with

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short

short accounts of them, and references to several authors who have heretofore wrote about them, in thirty-eight volumes in folio, and eight in quarto. Some addition has been made to this valuable collection since it was deposited in Montague-house, especially to the fossils, by a valuable present from Gustavus Brander, Esq.

C H A P.

C H A P. II.

THE excesses of heat and cold have, in some instances, near the same effect: fire blisters the skin; and, in the coldest seasons at Hudson's Bay, and in the northern parts of Europe, the touch of cold iron, &c. is dangerous: for metals, by their greater gravity, are, in proportion, colder than frozen water; and, if touched by the hand, will blister and take off the skin. A sort of chemistry may be performed by frost as well as by fire. A friend of mine, who resided some years at our settlements at Hudson's Bay, in North America, told me, that on broaching a barrel of lime-juice, for the use of their factory, they found it to be hard frozen, which obliged them to take off the hoops from the barrel, and chop off some of the ice for their use: this, when melted, they found to be almost as insipid as water; and concluded, that the whole cask was spoiled, and of no use; but, on breaking farther into the ice, they found in the centre of it a small

quantity still liquid, which was so sharp and acid, that a drop of it could hardly be endured on the tongue : this small quantity was preserved to sharpen their liquors, and went almost as far as the whole barrel would have done, had it continued unfrozen. Olive oil is said to become so hard in that country, that they cut it out of the jars with chisel and mallet ; and it is dangerous to stand in the way of its splinters, for they cut the eyes like glass. The same curious person also gave me some account of the large islands (as they are called) of floating ice, which frequently appear in that tract of sea our ships make between the north of Scotland and the southermost cape of Groenland, in their way to and from Hudson's Bay. These masses of ice, he says, might be taken for land covered with snow, did they not find them in places, which they know, from long experience, to be open seas. Some of these islands appear high and craggy like rocks, having lower parts or plains ; and, when the warm seasons are coming on, the sun melts the snow and ice, and causes cascades to fall from the craggy high parts into the lower, where the water settles in hollows, forming

ing itself into lakes and rivulets. In their voyages they sometimes go into these islands to fetch fresh water, and hunt for game, which they shoot in plenty, the pools abounding with many sorts of sea-fowl: they also find on them some quadrupeds of the neighbouring countries, such as the white Bear, an amphibious animal, with some others which are natives of those northern parts. These islands are found in very deep seas, and are many of them supposed to be some hundreds of feet deep in the water; since, otherwise, their upper parts would not rise so high above the water as they appear to do; for, in floating ice, a small proportion of its thickness appears above the water. These great masses of ice are certainly broken, or some how or other detached from the shores or land in the high northern latitudes; otherwise, I think, no land animals could be found on them: but how, or in what manner, I cannot presume to conjecture. Some of them extend in length and breadth many leagues. I believe these icy islands have often deceived northern voyagers, who have pretended to the discovery of islands in certain latitudes and longitudes, which never could be seen by after voyagers,

voyagers, who diligently sought for the latitudes, &c. pointed out.

To the above account of Hudson's Bay, I shall make bold to subjoin an extract of Mr. Ellis's voyage thither, when, he is speaking of the farthest part to which they went in Wagers' Straits, he says, "I cannot help, however, taking notice, that in ascending those mountains, we had at once as great, as gloomy, and as awful a prospect, as perhaps ever astonished mortal eyes. While we walked along the beach, the ridged rocks above seemed pendent over our heads; in some places there were falls of water dashing from cliff to cliff; from others hung prodigious icicles in rows one behind another, like the pipes of a vast organ; but the most tremendous part of the scene was the shattered rocks and craggs which lay at our feet, and appeared plainly to have burst from the mountain's tops, through the expansive power of the rigorous frosts, and so rolled with inexpressible fury down the sides, till they reached those places where their ruins now lie. I call them ruins, for such they properly were; and if there is something

thing that deeply affects us, when we behold either the waste of war, or the devastations of time; it may be easily conceived, that something much more terrible must be felt from the sight of the amazing relics of the wreck of nature."

An attempt towards discovering the cause of the great rising of the sea, and the uncommon agitation of the lesser waters at Lisbon, and other parts far distant from thence, immediately after the dreadful earthquake, on the first of November 1755.

THE causes of earthquakes are, I must confess, altogether unknown to me ; but whether the late violent far-spreading shock proceeded from the atmosphere or air above us, or from subterranean convulsions, makes no difference in regard to my conjecture, which only respects the agitation of the waters.

If the solid parts of this globe be considered, as connected and joined altogether in one mass, (though superficially divided into main-lands and islands) and the waters as a fluid, which may have a motion independent of the solid earth : then supposing the earth should receive some excessive violent stroke, either from without

out its circumference, or from within its bowels, which might, in any manner, stun, stop, retard, or check its diurnal motion on its axis, (as I think might probably happen from so violent a shock as that of the late earthquake) in such a case, the earth's being stopped in its diurnal rotation, or only checked or retarded for a few minutes, or even seconds, must necessarily occasion a great agitation in the seas and other waters : for as the earth turns from west to east, and the waters are moved equally, and in the same direction with the solid parts, if the solid parts are suddenly stopped or retarded by any unnatural violence, such stop cannot be immediately communicated to the watery parts of the globe, but they will move still onwards in their first direction, and continue their motion eastward, according to the diurnal rotation of the earth, till meeting with lands to oppose their motion, they rise upon the shores to such a height, and increase by degrees so much in weight, that the foremost waves, becoming an over ballance for the waters behind (which must be lower than they) vibrate backwards and forwards, until the cause of such an unnatural motion ceases.

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This may particularly be supposed to be the case on the coasts of Portugal, which lie open and exposed, and, as it were, meet the whole force of the great western ocean, which would still keep its course for a short time, though the shores of Portugal should be stopped or slacken in their motion.

Lesser waters may likewise be supposed to have been affected proportionably, by an instantaneous stop or decrease of motion under them: and the waving of the candles in a tallow-chandler's shop in Holland, as mentioned in a letter to the Royal Society, may be accounted for on the same principle; nor is it improbable, that every vessel of water, or other liquor, in our houses, had some little motion at the time of the shock; for it is reasonable to believe, that every thing, both by sea and land, was more or less affected in proportion to its situation, and as it was nearer to or more remote from the place agitated with the greatest violence, which place is not I believe exactly known. I also imagine it will readily be allowed, that the motion of the earth, according to the ordinary course of
nature,

nature, might be checked or diminished for a very small space of time, without its being perceived by sense, or discovered by any of our time-keepers. I am of opinion, that time will discover to us, that this mighty shock has extended its influence farther than the generality of people imagine. I think it already appears, that the whole Atlantic Ocean has been violently moved. Many accounts from America we received, which mentioned unnatural and sudden risings and fallings of the sea, without giving us the precise time, tho I believe them to have been on the first of November. One letter particularly from Barbadoes says, on the first of November, at about two o'clock in the afternoon, the sea ebbed and flowed in a strange manner, and brought up fish over the wharfs into people's houses. See *General Evening Post of December 27. 1755.* This seems to prove, that the shock was rather on the eastern than on the western side of the great Atlantic Ocean. Therefore, supposing the cause to be in Portugal, its progressive motion may be traced to the West-Indies, which motion seems to have taken up about seven hours ; for from ten in the morning in Portugal, to two in the

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the afternoon in Barbadoes, make four hours difference; and the hours between the longitudes of the two places, makes in all about seven hours; which seems but a small space of time to extend a motion over one of the greatest oceans on the earth, the distance of Barbadoes from Lisbon being about equal to fifty degrees of the earth's latitude.

A Brief

A
BRIEF AND GENERAL IDEA
O F
DRAWING and PAINTING
I N
WATER COLOURS ;

Intended for the Amusement of the Curious,
rather than for the Instruction of Artists.

I shall not meddle with perspective: yet, it may not be improper to hint, that persons who are unacquainted with it can be no proficient in drawing, as is manifest from the works of some painters of no small fame, in whose works a mathematical eye discovers very gross absurdities. We have many good authors of our own, as well as translations from other languages, on the subject of perspective ; from which any one may easily gain a general conception of the art, and by a little labour become a master of it.

Per-

Perspective is principally necessary in regular buildings, where many straight lines run through the various parts of them, of which all that are parallel must meet in one point. In other subjects a thorough knowledge of perspective is not so absolutely necessary; yet a due regard for it is always to be had; as in landscapes, to diminish every thing according to its supposed distance from the eye; for, by making the distant figures the least, and drawing them in finer or fainter lines than you do those that come forwards in your picture, they naturally seem to be more distant; and when you come to finish such picture, your extreme distant objects should appear so faint, or so secure, as not to be discovered to be of any precise form or colour; for so it is in natural objects far distant from our sight. As objects draw nearer they may be made a little more expressive; and so on, more and more, till you come to the nearest objects of all in the fore-ground of the picture, which should be finished with great strength, and brighter colouring: for it must always be considered, that such objects as have really in themselves a very bright colouring, if they are removed

moved to a little distance from the eye, will lose (by the interposition of the air) some of their lustre; and by being farther removed they will lose more of it, till they appear, as it were, colourless: for if several men, cloathed in several very different and glaring colours, be placed on a distant mountain's edge, just within the utmost reach of the eye, we may discover these men as objects distinct from each other, but without any other colour than what is caused by seeing them through a great space of greyish air; so that very distant objects may properly be said to have neither light, shadow, nor colour. Any common observer may perceive, when he commands an extensive prospect, where there are ranges of distant hills one behind another, that the most distant are of a flat, faint, bluish colour, without any lighter or darker parts, and consequently without any distinct objects visible on them; therefore, if you would make a picture appear like nature, your greatest distances must be faint. Those hills, that lie a little nearer, may shew some small distinction between wood-lands and the bare surface of the ground; on others, still nearer, we may distinguish.

guish churches and villages, till we come nearer still, where particular houses, men, and cattle, may be perceived, and so on, till we see distinctly every visible object about us.

A theory of this sort is absolutely necessary in every painter who would imitate nature in almost any respect. To run it over again; from a near view to a distant place, let your first or nearest objects have pure and bright colours, according as the nature of the subjects may require. These should be finished with great lights and strong shadows: those at a little distance should be something less bright in their ground-colours, not so high in their lights, or so deep in their shadows; and as they are farther distant, they should diminish more in the purity of colour, as well as in light and shadow, till they have neither light, shadow, colour, or distinct form; for all is confused, and mixed at very great distances. As one goes backwards in a picture, much finishing is to be spared; the windows of a house are not supposed to be visible at some miles distance, though the house, in its general form, may be seen. As to little ornaments in
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dress, they are always to be let alone, if a figure be at any distance, for we know that the buttons on a man's coat, or a lady's trinkets, are invisible at a little distance.

In speaking of colours, I shall not perplex the reader, as the common books on the subject of drawing, &c. have done; which tell you what to mix together for a ship, trees, the earth, a brick house, lion, fox, &c. for these particulars are trifling and superfluous. The way to colour well is, when we are provided with all necessary colours, to consult the natural colours of the objects we would represent; then by casting the eye over the colours we have ready prepared, it is very likely we may find something that in many cases will serve our turn, pure and unmixed; but if we cannot, let us consider the colours in a compound sense. We have an object, for example, which is purple; amongst our colours we do not find that, but by mixing red and blue it is produced. Blue and yellow produce green. Red and yellow make an orange-colour. Red, blue and yellow, make browns and cloth-colours of all kinds, by varying the

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quantities of each ; so that red, blue and yellow, by a compound of some two of them, produce the fine colours, viz. purple, green, and orange-colour ; and the three primary colours, red, blue and yellow, compounded all together, in different proportions, produce all the different degrees of browns and cloth-colours, and a shadow for white itself : for if you take a round piece of card-paper, and divide it into three parts, by lines from the center to the circumference, and wash these three parts with the three primary colours, so that neither of them be too strong for the other, and all them pretty light, then fix a pin in the centre, and turn it about swiftly, you will find the colours will be lost in each other, and the paper will appear white, though not of so pure a white as before it was coloured.

Though all colours may be compounded from three of the principal colours, yet as the colour-shops produce a long list of colours, wherein are variety of reds, blues and yellows, of different shades and casts, as well as browns of many different sorts, it will be convenient for
those

those who set out in painting or colouring, to be furnished with all of them, which may save some trouble in compounding.

I shall give here a few hints on the preparing of colours; though this subject has been largely handled already.—Common reason will teach one to reduce all hard substances by grinding them well on a stone, and after grinding them, to levigate them finely in water, by pouring them several times out of one vessel into another, after stirring them, and letting the gritty and grosser parts settle: this not only takes out all the gritty and gross particles, but frees many earthy and mineral colours from corrosive salts, which would have a bad effect, by making a work spotty, or changing the colours, as well as attracting moisture, which in time is apt to rot the canvas or paper on which they are laid.

There are some few colours which are only gums; these are gamboge and sap-green: they hold themselves on the paper without any additional gum; but all the mineral, or earthy colours, must be mixed with a due proportion of

gum-arabick, or senega, to bind them together, and make them stick to the paper. If there be too little gum, the colours will rub off if you pass your finger over the paper when dried : if too much, the colours will shine, crack when very dry, and sometimes peel off. What I say must always be understood of water-colours, or painting and colouring in water. Indigo must be ground with gum dissolved in water, and, when well ground, dried in small drops, which will be easily reduced again to a liquid, in fair water, fit for use. I have discovered a secret relating to purifying indigo, which may be of use : make a strong lye of pot-ash, then break your rock-indigo pretty small, and put it into the lye, so that it be covered : it may stand a month or more. When you pour off the lye, cover it with boiling water, shifting it every day till the water comes from it pretty clear, and it will be purified from all its filth ; for the lye, and many of the waters after it, will come from it of the colour of very strong brown beer, while the blueness of the indigo is not extracted ; the foul colour is drawn from the rotten leaves that are mashed with the indigo when it is made up :
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—it should be thus prepared before the grinding.

There are two useful colours I have not mentioned, white and black, which some count no colours at all. I think they may be termed the two extremes of colouring, since the one is the strongest light we can lay on, and the other the deepest shade. These are seldom used pure, but are mixed with other colours. The white (where colours are laid on in a body) mixed, in different proportions, with any other colour, makes all the variety of shades that the two colours so mixed are capable of producing. White may be compounded with any simple or compound colour, to produce different shades thereof. Black is often mixed (a little of it) in the shades, where the object is of a beautiful and primary colour, as red, blue, or yellow; for these colours, shadowed with fine dark colours of their own species, would be too glaring, and quite unnatural; so that it is necessary to allay them with black, or some dull colour; for if you observe nature itself, for example, a fine red or blue garment, it will appear exceeding
fine

fine in the first and second lights ; but if you attentively examine the deep shades, the colour is often so obscure that you can call it by no particular name.

There are two ways of painting in water ; one by mixing white with your colours, and laying on a thick body ; the other is only washing your paper or vellum with a thin water tinctured with colour. The first method, which may more properly be called painting, is thus performed : when you have a drawing finished in out-lines, you lay in your colours mixed with white, in such a medium, as to be about the middle colour between your highest lights and deepest shadow. You may lay in the whole piece before you begin to shadow and heighten, or lay in and finish it in parts as you think best : if you do it in parts, the distances must be done first ; because the out-lines of the parts more forwards, may then be worked over the more distant and first finished parts. When you have laid your ground, the way is, to shadow first with the same colours you have laid in, only with less white in them, till you come to your deepest shadows, wherein

wherein is no white at all; but it is to be remembered, that these strong shadows are required only in the front objects of the picture, and that the deep shadows of the fine colours must be allayed with black, or brown, to give them their natural obscurity. When the dark shadows are finished, you may begin to heighten the lights, by adding white to the colours with which you laid in the different parts of your picture; observing always, that as objects are little shadowed, they must be little or nothing heightened when very distant; but front-figures may be heightened very much: yet we should avoid using pure white in the heightening of any object, unless it be of a white colour, or hath a polished surface, or be some other body that reflects the light very strongly.

When all the particular parts of a picture are finished separately, the whole is to be carefully surveyed and considered, to see that there is harmony throughout: for, if distances nearest to the fore-ground are too faint, they will seem to be farther off than their perspective proportions will allow: or, if your greatest distances are expressed

pressed too strong and distinct, they are brought too near, and contradict the sense and meaning of the piece; so that after finishing the parts, there generally wants some amendment in the whole, to make a proper harmony in a picture.

In designing, it is generally necessary to contrive a piece so, that the objects shall be relieved by the ground, or relieve each other; for example, if you have light or bright objects, the ground behind them may be a group of dark-green trees, or shrubs, which will bring them forwards, and make them appear to advantage. If you have objects in your foreground, that are in the shade, or in themselves are of dark colours, then it will be convenient to place behind them some light objects, such as a clear opening in a landscape, either the earth, hills, or sky. It is also often necessary, the better to free a large object from the ground, to make the ground dark on the light side, and light on the dark side of such object or figure; but yet the ground must be so studied as to appear very natural, and conceal the artist's contrivance.

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In a piece of painting, special care should be taken that there be no very sharp, or hard lines (as we call them) or any sudden lights immediately bordering on dark shadows, for they are discordant in painting: on the contrary, the outlines of objects should be so broken into the grounds behind them, as not to be precisely traced. Many great painters, to avoid a too shocking glare of colours, have broke the colours of their draperies, as well as other objects, into one another, for they are really so in nature: for example, expose a red and a blue sittin in a good light near each other, and they shall both appear purple in those parts of each of them which directly receive the reflection of the other: the same is to be observed of other colours, so that many painters have harmonized all their colours, by never introducing a direct red, blue, yellow, or hardly any other gay colour, without some little mixture or allay.

I shall proceed to speak of washing, or staining in colours, either of drawings or prints, by way of hint to private persons, who like to amuse themselves in that way, rather than to artisans.

artisans.—And first, of the common way practised by the print-shops about the town, in their views of palaces, gardens, figures, and all pictures for common sale. These are to be considered as cheap things, done with much expedition, and with little study, as to propriety in colouring; for such is the judgment of the bulk of the people, that the more glaring they are in their colouring, and the more distant from nature, the more they are prized. These common washers generally mix a little white in their skies and distances in colouring of prints, because it takes off the harshness of an ordinary print, as most of them are that are sold coloured.

A fine print, coloured by a judicious artist, may be made almost equal in value to an original drawing in colours: but for such no one will pay a price equal to its worth. To make an intire drawing in the thin or washing way, it must first be drawn in out-lines, and then you may proceed to finish it with different colours in its different parts, as the nature of the thing requires, beginning to wash with water thinly
tinctured

tinctured with colour, at first, and gradually proceeding to use it more strong in your shadows, employing no white at all throughout your work, but carefully leaving the white of your paper in the high lights of white objects, and very thinly washing the lights in coloured bodies. You are to observe, that this method is no more than making a drawing in Indian ink, only instead of making it all black, you use fine prepared colours in the different parts of your picture.

I have spoken already of the management and mixture of colours. Prints may be coloured this way, without white intermixed; all the prints in my Natural History being without white, for such water-coloured prints, or drawings, as have white mixed in their colours, are apt to change black. In order to procure colours that will be exceeding fine, and run very smooth in this way of washing, mix a little gummed colour in a large shell, and work it well with your finger; then thin it with water, and let it settle a little, and by pouring a little off the top of it into another clean shell, you will

will procure a fine free working colour, which you may make as light as you please by the addition of water. If a colour doth not spread itself freely, by reason of any greasiness on your paper, if you touch your pencil ever so little in ox-gall, it will make your colours run free. Always observe in these first and lightest colours to use a large pencil, in order to fill up the space you have to cover with all convenient expedition ; for if you are slow, and let your colour dry in parts, and touch again over their edges, your colours will be blotchy and streaky.

Paper proper for drawing on in this way, ought to be neither over nor under-gummed : that which is too much gummed, or sized in the making, is so hard and close it will not take in the colours at all ; and what is laid on at first, one is apt to wash off again in the second shadowing, and so on, which is very inconvenient. An under-gummed paper hath a contrary inconveniency ; for the colours are apt to run through it, and spread beyond your design on the outline. A proper paper may be chosen by touching it with your tongue : an ungummed paper will

will stick very strongly to the tip of the tongue when touched : an over-gummed paper will hardly stick at all ; by which a proper medium may be found, that only sticks a little to the tongue. It is of small import, whether your paper be very white, or not ; for provided it be of an even clear grain and surface, a cast on the yellow or cream will not hurt the drawing when finished. If a print that you would colour be on a loose ungummed paper, it may be prepared for colouring by washing it over (once or more, as it may require) with a thin paste made of wheat-flour, boiled in water, and letting it dry on between each washing.

I am far from thinking myself properly qualified to treat on the arts of designing and painting ; yet it cannot be amiss for any person to treat of an art, so far as it hath fallen within the compass of his own experience and observation.

Some

SOME
BRIEF INSTRUCTIONS
FOR
ETCHING OR ENGRAVING
ON
COPPER-PLATES,
WITH
AQUA FORTIS.

IN the course of my performing the engraving or etching of the copper-plates contained in my Natural History, I received not only the instructions of my friends, but bestowed some pains to examine such authors as had wrote on the subject of etching with *Aqua Fortis*.

I could find little or nothing on that subject originally wrote by any author of our own country;

try ; and what was translated from those of other countries, was from authors of ancient date, wrote, I believe, before artists in that way had arrived at the perfection of knowledge they have now attained ; and many of these authors seem not to have practised it themselves ; for I have been led by them through many labyrinths (from which I found it difficult to extricate myself) before I attained the ready practice of etching, which I am here willing to communicate, in as short and plain terms as I can, for the benefit of many curious young gentlemen who are my friends and acquaintance.

First of all, it will be proper to say something of copper-plates.—Authors on the subject of etching, tell us how to smooth, scour, and polish them for use ; which is, I believe, a thing hardly any gentleman will trouble himself about, seeing that several people, in and about London, make it their business to square and smooth plates of all sizes, for persons who want them. Examine your plates when you buy them, to see if they are perfectly free from scratches, dents or holes ; and if they are
bad,

bad, see that the maker mend them before you take them of him. When you are provided with a plate, the next thing to be considered is, a ground to cover it withal.

General Instructions in relation to Grounds or Varnishes, proper to lay on the Plates before they are etched.

The ingredients generally made use of for the ground or varnish, are, first, *Asphaltum*, called also *Pitch of Judea*, or *Jew's Pitch*: it is a pretty hard, black, pitchy, or resinous substance, commonly brought to us in large gourd shells, containing, more or less, about forty pounds, and to be had of the most eminent druggists in London. The second is Bees-wax, either white or yellow. The third is common Rosin. The fourth is Mastick, a sort of fine hard rosin in small grains. I have sometimes added a little common pitch to soften it.

Though it will be proper to vary your ground a little, according to the different times of the year you work in, for that which does very well
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In frosty weather, may be so soft as to stick to your fingers in summer; therefore what is used in winter must have a greater proportion of the softer materials, such as the wax and common pitch; and that which is for summer use may have more of the harder materials of the receipt, which I shall here give at a medium, as near as I can, between the two extremes.

A RECEIPT for a Ground or Varnish.

Asphaltum	— — —	$1\frac{1}{2}$ Ounce
Bees-wax	— — —	2 Ounces
Rosin	— — —	$\frac{1}{2}$ Ounce
Maſtick	— — —	$\frac{1}{2}$ Ounce
Common Pitch	— — —	$\frac{1}{4}$ Ounce.

Put all these into a new pipkin well glazed, and place it on a moderate fire, and as the ingredients melt, stir and incorporate them very well together with a little stick: be careful that they do not take fire, or boil over. When all is well melted and mixed, let it stand a little while in the pipkin, till the bubbles have done rising, and some of the grosser parts are a little settled.

to the bottom; then pour it off into a basin of water, leaving the dregs in the pipkin. When it is a little cooled in the water, take it out, and roll it into a long form, of the thickness of your thumb; and while it is yet warm, cut it into pieces of two inches long, more or less.

You may make double the quantity of the receipt, but cannot well make less. I have found that my Ground, by long keeping, has grown too hard and dry, which I have rectified by melting it down again, and adding a little common pitch.

To lay the Ground on your PLATE.

Take your copper-plate, and clear the surface of it well from all tarnish or dirtiness; then having some charcoal lighted, in an earthen pan, or chafing-dish, fix a small hand-vice to the edge of your plate, and you may then hold the back-side of it downwards to the charcoal fire, that the polished side may lie upwards to receive the Ground or Varnish. When your plate is of a due heat, have a piece of your Ground tied up
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in some very thin silk, or farfenet, to keep the ~~dreddy~~ parts from getting through; then pass it over your plate, in all parts, that the plate may be wholly covered; then take a little wad of cotton, tied up in a thin piece of silk, and pass it all over your plate, to spread your varnish even. When it is so spread, let the plate gradually cool, and while it is cooling dab it all over with your cotton puff, and it will lay your Ground still smoother, and with a finer grain, or rather shew no grain at all. When you have so spread your varnish on the plate, have ready a very large candle, and hold the varnished side of the plate over the candle, moving it backwards and forwards, till it be of a good black in every part, but be careful the snuff do not touch the plate: after which lay it to cool, and it is fit to work upon.

Care must be taken in heating your plate, for if your fire be too fierce, your plate will turn of a bluish colour: if you perceive any such change on your plate, it must be cleansed bright, and heated again, for such burnt places will not hold the Ground when the *Aqua fortis* is laid on.

When the plate is varnished, and cold, you may try how your Ground bears the needle, by hatching (in a waste corner) some close strokes two contrary ways over each other ; and if it is of a moderate temperature, so as neither to stick to the fingers by its softness, or fly from the copper by its brittleness, you may venture to bestow some labour on it, and proceed in your work.—The next thing in order, is to trace your design on the plate.

*To trace the Out-lines from a Print or Drawing
on your varnished Plate.*

A print that is not of any value, may be rubbed on the wrong side with red chalk, red oaker, Spanish brown, Indian red, or any other fine soft colour that will rub dry into the grain of the paper. When you have so done, lay it on to your plate, and be careful that it doth not slip in the working ; then trace over all the out-lines of your print with a stick of ivory, having a pretty small smooth point ; for an actual sharp point will injure the print, and perhaps raise the varnish behind it. When
your

your principal out-lines are drawn, you may touch over some of the less principal lines in order to have as much of the print on the plate as you can. When all is drawn, take off the print, and you will find the colour sticking to your Ground, wherever you have drawn over it with your stick. If you have a curious drawing, or print of value to copy, you may rub your colour into another paper, which may be laid on the plate first, with the coloured side downwards, and your drawing may be laid on that, and it will do pretty well; but you will have a better out-line through a single paper, than through a double one.—When your design is traced on the plate, you must be furnished with tools to etch withal.

NEEDLES *for* ETCHING.

Take half a dozen needles, of different sizes, which may be stuck into small cedar-sticks for handles; the points may be drove into the sticks, after which you may break off their heads, and grind new points on a hone or oil-stone: these may be of various degrees of sharpness,

nese, in order to make strokes of different breadths. When you are so furnished, you may begin to work on your copper.

Of ETCHING on your varnished PLATE.

It will be necessary, before you begin, to have a piece of very clean, soft, old linen rag, with all the seams and selvages torn off : this may lie double under the hand you work with, to keep the heat, sweat, or roughness of your hand, or nails, from softening, scratching, or otherwise injuring the Ground. Then take one of your middle-sized needles, and trace over the out-lines that you have made on the copper, minding to touch strong enough to cut through your varnish. When all your lines are traced, you may wipe the plate with a soft wet sponge, to take off the coloured out-line ; so shall you see what you have traced with your needle more distinctly : then set the print or drawing before you, on a sloping board or desk, and carefully copy it in its lesser lines, by your eye, observing to touch with a fine pointed needle, and a very light hand, the light parts of the print or drawing

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ing you copy; and, with blunter pointed needles, give more strength to your strokes, as the darkness of the shadows increases; and by a little practice, observation and care, a piece may be finished this way, without the help of engraving after the common method.

I have found by experience, that some labour may be saved in etching, by a sort of artifice, which has an effect beyond any thing that can be performed with the needle; that is, in case you have a dark object, on which you would represent many small white, or light spots, first etch such object with close cross hatches, so thick that it would print almost black; then take a fine hair pencil, dipped in common turpentine varnish and a little lamp-black, and touch with the pencil what shaped or sized spots you would express on the abovesaid dark strong hatching, and it will dry on, and prevent the *Aqua fortis* from taking effect, or eating in those places; and so they will print white. The same sort of varnish, with a little lamp-black, is a good stopper, in places where the varnish is accidentally rubbed off, or where any small error

or

or mistake is committed, and when dry may be worked over again to rectify a mistake. The piece should be thoroughly examined, and all omissions rectified, before the *Aqua fortis* is applied to the plate.

*A soft Wax for bordering the PLATE to keep on the
Aqua fortis.*

Take white rosin and bees-wax in equal parts, incorporate them together over a fire in a pipkin, and make the mixture into a roll for use. If it be found too hard to be worked and kneaded with your hands in winter, it may be brought to a greater or less degree of softness, by melting it again, with a less or greater proportion of olive oil.

When your plate and the wax are ready, take a piece of the wax, wet your hands, and roll the wax out in length like a cord, sufficient to go round the borders of your plate ; then lay your plate in an horizontal position, where it may lie firm ; then fix your wax on its edges very close, that the *Aqua fortis* may not pass between the

wax

wax and plate, then pinch it up to an edge, and so make it into a kind of wall of half an inch high ; after which pour on your *Aqua fortis*, a proper sort of which is to be had at most of the chemists shops in London, and is generally too strong to be used without a mixture of water. You will know when it is too strong, by its almost boiling on the plate where it touches the copper ; therefore you are to lower it with water, till you see the bubbles rise very moderately ; for too great a strength of *Aqua fortis* will break up your Ground, and spoil your plate.

When the *Aqua fortis* has been on the plate a little while (about half an hour) if you perceive by the equal bubblings that it has bit kindly, it may be taken off, and the plate clean washed with fair water, and well dried ; then you may try the depth of your strokes by rubbing off a little spot of the Ground, and, if you find it too faint, put the *Aqua fortis* on again ; but if you think it has bit enough for the first time, you may stop (with the before-mentioned varnish) all those parts that you would preserve light and tender : let your varnish dry a little,
then

then put on your *Aqua fortis* a second time, and let it lie about half an hour. It may be taken off, and put on again, if the case requires; and you may stop other parts that you would not have very dark; but remember to wash and dry your plate every time you stop with the varnish. Few of my plates have had the *Aqua fortis* on them less than half an hour on the lighter parts, or more than a hour and an half on the darker parts. When the plate is bit in as deep as you would have it, wash the *Aqua fortis* well off from it; then screw your hand-vice on the edge of it, and hold its wrong side a while before, or over a fire, and the wax border will slip off; then take a little olive, or any oil, put it on the hot plate, and rub it over with a rag, then wipe the plate clean, and you will see your design very plain. The plate is then fit to send to the rolling-press for a proof, after which, any common hand may put in a few strokes with a graver, in case there be found any little deficiencies.

Thus have I given as much, and no more, on the subject of etching, than I have discovered from

from my own practice and experience. There are, I believe, many of my countrymen, who could give far better instructions in this art than myself; but some of them, perhaps, are idle, and others interested to keep it secret. I know of none that have advanced any thing worth naming, on this subject, in our language, but what is translated from some other.

ANNECDOTES,
AND
ADDITIONAL ACCOUNTS
OF SOME
Subjects in Natural History.

The BEARDED VULTURE.

ON laying this bird before the Royal Society, as a subject unknown, my friend, Dr. Parsons, took particular notice of two large groups of feathers that fall on the sides of the lower part of the back or rump, and fill up the spaces or gaps between the back and wings, when the wings are closed; and having observed the like feathers in Eagles to be raised up at the pleasure of the bird, he examined these in the Bearded Vulture, and found them to be no part of the wing, but that they had their bottoms
fixed

fixed only in the skin on the sides of the back : and thinking it strange that the skin, simply, should have the power to raise, and keep supported, a large group of long feathers, he asked me if he might open that part of the skin at the roots of these feathers, which I was very willing should be done for the satisfaction of the Doctor's curiosity, as well as my own. On opening the skin, the Doctor soon discovered the muscle described in his following curious letter, wrote at my request, which he has given me free liberty to publish for the information of the curious.

S I R, *Red-Lion-Square, Sept. 21, 1750.*

“ It is but doing you the justice due to your great care and industry, in obliging the world with your excellent *Natural History of Birds*, to communicate any thing in my power, which might fulfil your laudable intention of putting what you do in a clear light, for the better understanding of the branch you are engaged in.

“ I have made honourable mention of you, in my lecture upon the muscles, which I dis-

covered in the Sea-Eagle and other birds, read on Thursday the 31st of May last, before the Royal Society, on account of the happy opportunity you were so kind to give me of dissecting the African Bearded Vulture, which you shewed to them at one of their meetings, in order to search for the same muscles, which I found in your company.

“ Whatever relates to their actions, not only in the Eagle and Vulture-kinds, but also in every other bird whatsoever, will be found in the above mentioned lecture, in the transactions of that time : but as this pair of muscles, and indeed some others mentioned in my lecture, were never observed before, it may not be improper to add a little account of them to your History of the Vulture, if you think proper ; for they are about the same size, and in the same situation with those of the *Haliætos*, which gave occasion to the lecture ; and both birds are nearly related to each other, being of the same genus.

“ This muscle on each side is about two inches long, arising fleshy by three digiti from the
second,

second, third, and fourth ribs, and ending also fleshy in the skin a considerable way behind the wings. It is a bundle of fleshy fibres about as thick as a small finger, and equal in bigness all along; it has a very strong action, being entirely fleshy, and must of consequence contract in every part; and as the place of its insertion in the skin is also the place of the insertion of a large group of feathers, having no sort of connexion with the great wing, which is moved by its own proper muscles analogous to those of the humerus in other animals, it must have been designed for a very particular use both in land and water-fowls, for which we must refer to the said lecture, where they are fully accounted for. In the mean time you will please to add the name I have invented for this muscle, which will in some measure be expressive of its use. It is the

Musculus novus remigatorius,

The new steering, or rowing muscle.

“ Now, in water-fowls, as well as in those of land, this may be called the *Remigatorius anterior,*

rior, as moving a group of feathers in the fore-part of birds ; but there is another pair which I discovered, and call the *musculi remigatorii posteriores*, as moving a group of feathers behind, and these are described in the same lecture.

“ I am, with sincere wishes for your health, and success in your undertakings,

“ Your friend, and humble servant,

“ JAMES PARSONS.

Of the PORCUPINE.

Extract of a letter, dated Albany, Aug. 10th, 1742.

The Porcupine, in this country, is a beast which makes its nest or den under the roots of great trees, and sleeps much ; it feeds on the bark of juniper and other trees, but chiefly on juniper ; in winter it eats snow instead of drinking, and laps water in summer like a cat or dog, but carefully avoids going into it. His hair and quills remain all summer without alteration of colour ; but as the weather grows warmer in the spring, the fur grows thinner, as in all creatures

tures in this country: since our conquest of America, many have been brought alive to England.

The WHIP-POOR-WILL, or LESSER GOAT-SUCKER.

The following account Mr. Catesby received with these birds from a Gentleman in America :

“ They come to Virginia about the middle of April, from which time, to the end of June, they are heard every night, beginning about dusk, and continuing till break of day ; but it is chiefly in the upper or western parts that they are so frequent : I never heard but one in the maritime parts ; but near the mountains in the month of May, within a few minutes after sunset, they begin, and make so very loud and shrill a noise all night, that the echoes from the mountains increase to such a degree, that the first time I lodged there I could hardly sleep : they are seldom seen in the day-time. The Indians imagine these birds are the souls of their ancestors formerly slaughtered by the English,
and

and say, that they never appeared in their country before that slaughter. Many people here look on them as birds of ill omen. I have been informed they lay two eggs, of a dark green, spotted and scrawled with black, in the plain beaten paths, without any sign of a nest, upon which they sit very close, and will suffer a near approach before they fly off."

The PETERIL.

The Peteril is a native of the Cape of Good Hope, where it is called the *Pantado*, which is a name the Portugueze have given to other birds, of a different nature, where they find them spotted or painted, as the name denotes.

Dampier says, " between Brasil and the Cape of Good Hope, we passed by a dead whale, and saw (as I may say) millions of sea-fowls about the carcass, (and as far round about it as we could see) some feeding, and the rest flying about, or sitting on the water, waiting to take their turns. We first discovered the whale by the fowls, for indeed I never saw so many
fowls

fowls at once in my life before, their numbers being inconceivably great: they were of divers sorts, in bigness, shape and colour. Some were almost as big as geese, of a grey colour, with white breasts, and with such bills, wings, and tails. Some were Pintado-birds (our white and black spotted Peteril) as big as ducks, and speckled black and white. Some were Shearwaters, some Peterils. We saw of these birds, especially the Pintado-birds, all the sea over, from about two hundred leagues distant from the coast of Brasil, to within much the same distance of New Holland. The Pintado is a southern bird, keeping within the Southern Temperate Zone, for I never saw any of them much to the northward of thirty degrees south: the Pintado is as big as a duck, but appears, as it flies, about the size of a tame pigeon."

Of the Little Peteril I have seen a great many together, in the midst of the more northern or widest part of the German Ocean, where they must have been more than 100 English miles from land. It is strange that so small a bird should be able to subsist in such open seas, where they

they cannot rest but on the water, which is always pretty rough. Those I have seen were continually on the wing; they appear not, but in tempestuous weather, near ships, or land.

The EIDER COCK.

The Eider Cock is brown when he is young, but when he is old he groweth almost white, and is called Eider-Blink.

From this fowl is gathered *Eider-down*, which the Eider plucks from his breast and layeth in its nest about its eggs when it hatcheth them; and when the young ones are come out and fled away with their dam, this down is taken up from the nest, being then full of moss and straw, of which it is cleansed, and dried. The down which is plucked off at other times from the Eider is good for nothing, for it is fat, and rotteth.

The SUMMER-DUCK.

Mr. Catesby has described this bird in his history of Carolina, vol. I. page 97.

“ They

“ They breed, says he, in Virginia and Carolina, and make their nests in holes of tall trees (made by wood-peckers) growing in water, particularly cypress-trees. While they are young, and unable to fly, the old ones carry them on their backs from their nests into the water; and at the approach of danger they fix with their bills on the backs of the old ones, who fly away with them. The female is all over brown.” I suppose by the name, it is a bird of passage, and retires southward from Virginia, Carolina, &c. at the approach of winter. I have had the advantage of seeing several of these birds brought from Carolina to London alive, as well as the above described, which were newly killed. The females of these I have seen were all over brown, having something of a crest, like the male.

M A C C A W S.

To illustrate the history of the Maccaws, I cannot help borrowing from Commodore (now Lord) Anson's Voyage a beautiful passage, which describes a waterfall in the island of Qui-bo. “ Near the north-east point of the island they

they discovered a natural cascade, which surpassed, as they conceived, every thing of this kind, which human art or industry hath hitherto produced. It was a river of transparent water, about forty yards wide, which ran down a declivity of near one hundred and fifty yards in length. The channel it ran in was very irregular, for it was entirely formed of rock; both its sides and bottom being made up of large detached blocks, and by these the course of the water was frequently interrupted, for in some places it ran sloping, with a rapid, but uniform motion, while in other parts it tumbled over the ledges of rocks, with a perpendicular descent. All the neighbourhood of this stream was a fine wood, and even the huge masses of rocks which hung over the water, and which by their various projections formed the inequalities of the channel, were covered with lofty forest trees. While the Commodore and those who were with him attentively viewing the place, were remarking the different blendings of the waters, the rocks, and the woods, there came in sight (as it were still to heighten and animate the prospect) *a prodigious flight of MACCAWS, which hovering over this spot,*
and

and often wheeling and playing on the wing above it, afforded a most brilliant appearance, by the glittering of the sun on their variegated plumage; so that some of the spectators cannot refrain from a kind of transport when they recount the complicated beauties which occurred in this extraordinary water-fall."

MONKIES.

Monfieur de la Condamine, of the Royal Academy of Paris, in a voyage through the inland parts of South-America, down the river of the Amazons, gives the following account of a very extraordinary Monkey :

" The governor of Para presented me with a Monkey, which was the only one of its kind ever seen in the country, the hairs of its body being bright as silver, and of the colour of the finest fair tresses, whilst its tail was of a shining chefnut, inclining to black : it had still another singularity yet more remarkable ; its ears, sides of the face, and nose, were of such a lively red, that one could scarce be induced to believe it to
be

be its natural colour. I kept it a year, and it was living when I was writing this, almost in sight of the coast of France, but in spite of the continual precautions I took to preserve it from the cold, the severity of the weather killed it."

I once had an opportunity of seeing, in the house of the late Duke of Richmond, at Whitehall, an old she Monkey, who had been brought to England with young: and she brought forth a single cub, of which she was very tender. It was pleasant to see her hold it in her arms, and suckle it. Her actions and manner nearly resembled a woman's nursing her child. This sort of Monkey being pretty frequently brought into most of the maritime trading parts of Europe, it has probably been described by some former naturalist.

The BAT.

Monfieur de la Condamine, in his voyage down the river of Amazons, says the Bats which suck

suck the blood of horses, mules, and even men, when they do not secure themselves from them, are a nuisance common to hot countries in America ; and some of them are of a monstrous bigness. At Borja, and in divers other places, they have destroyed the great cattle which the missionaries had introduced there, and which began to multiply in those parts.

Dampier, in his voyage round the world, says, in the island of Mindanao there are Bats as big as Kites. Near the last mentioned island lies the island of Bats. Dampier says this island was the habitation of an incredible number of great Bats, with bodies as big as Ducks, or large fowls, and with vast wings ; for he saw at Mindanao one of this sort, and judged the wings stretched out in length could not be less than seven or eight feet from tip to tip ; for it was much more than any of them could fathom with their arms when extended to the utmost.

The reverend Mr. Hughes, in his *Natural History of Barbadoes*, p. 68, describes a Bat different

different from any I have met with : he calls it the Cave-Bat. He says, the Hebrew name is *Atalleph*, i. e. *a bird of darkness*. " This Bat, says he, hath its name from the place of its residence. It is often as big as a young pigeon ; its body is covered with a snuff-coloured soft hair ; its ears are more upright, and larger in proportion than those of a rat ; and its whole head, especially its mouth and nose, shorter and thicker. From the extremity of one wing to that of the other extended, measures eighteen inches : its feet are guarded with six sharp talons, each turning inwards like fish-hooks." I believe his giving it six claws on a foot to be an oversight ; for I have not observed more than five in those Bats I have examined. Mr. Hughes says, they have also, in Barbadoes, the same small Bat we have in England.

Whether the Cave-Bat hath a tail, as the two English Bats described by me, p. 201, of my Natural History, or not, Mr. Hughes does not inform us. There is, in the British Museum, a Bat from Egypt, of a size between this Cave-Bat and my Great Bat from Madagascar ; which
Egyptian

Egyptian Bat is tailless, and much resembles that of Madagascar, but much less. As a duck is a web-footed bird, a Bat is just in the same sense a web-footed beast or quadrupede, though they differ in many respects : a duck, or other water-fowl, hath the toes webbed together with a strong, tough, though pliable web, of a small dimension, yet large enough to work in so dense a medium as water : the Bat hath the legs forwards webbed principally, though these webs are always joined to the hinder legs ; the webs are exceeding thin, soft and pliable, and vastly extended in breadth, if compared with the webs on the feet of fowls ; the reason of which is manifest ; for the air being a medium vastly more rare than that of water, it requires a membrane broader, thinner, and more light and delicate to work and support itself therein. It is convenient for water-birds to have their oars in the hinder-parts of their bodies, because the water is under them, and they row themselves forwards on its surface ; but it is different in Bats ; for they have their webs principally on their forward limbs, in order to row themselves forwards in the air. A gentleman, an eye-witness, has

told me, that the great East-Indian Bats work their wings slowly, in the manner herons do with us, and not by a swift fluttering motion, as our little Bats do. On weighing what I have read in natural historians and voyagers on this subject, I have reason to believe there is a great number of distinct species of Bats, from the size of a very small bird, gradually increasing to (almost) the bigness of an eagle.

THE RUFFED HEATH-CKOCK, OR GROUS.

This bird is a native of Pennsylvania, where it is called a Pheasant. M. Bartram sent with it a very curious account in a letter to M. Colinson, of whom I obtained leave to take an exact copy; which is as follows:

“He is a fine bird when his gaiety is displayed; that is, when he spreads his tail, like that of a turkey-cock, and erects a circle of feathers round his neck like a ruff, walking very stately with an even pace, and making a noise something like a turkey; at which time the
hunter

hunter must fire immediately at him, or he flies away directly for two or three hundred yards, before he settles to the ground. There is something very remarkable in what we call their thumping, which they do with their wings, by clapping them against their sides, as the hunters say. They stand upon an old fallen tree that has lain many years on the ground, where they begin their strokes gradually, at about two seconds of time distant from one another, and repeat them quicker and quicker, until they make a noise like thunder at a distance; which continues, from the beginning, about a minute; then ceaseth for about six or eight minutes before it begins again. The sound is heard near half a mile; by which means they are discovered by the hunters, and many of them killed. I have shot many of them in this position; but never saw them thump, they mostly seeing me first, and so left off. They commonly exercise thumping in Spring and Fall, at about nine or ten in the morning, and four or five in the afternoon. Their food is chiefly berries and seeds of the country: their flesh is white, and choice food. I believe they breed but once a year, in

the Spring, and hatch twelve or fourteen at a brood, which keep in a company till towards the following Spring. Many have attempted to raise the young ones, and to tame them, but to no purpose. When hatched under a hen they escape into the woods soon after they are hatched, where they either find means to subsist or perish."

In order further to illustrate the history of this bird, I wrote to Mr. Brooke, of Maryland, in North-America, *May 1752*, now in *London*, to desire the favour of him to give me what account he could of the bird called a Pheasant, in the provinces of Pennsylvania, Maryland, &c. and he obliged me with a satisfactory answer, by letter, from which I have made the following extract, relating to the history of this ruffed Grouse or Pheasant.

"The Pheasant breeds in all parts of Maryland, some countries on the western shore excepted. They lay their eggs in nests they make in the leaves, either by the side of fallen trees, or the roots of standing ones. They lay
from

from twelve to sixteen eggs. The time of incubation is in the Spring; but how long their eggs are hatching I cannot say; but, probably, it is three weeks, the time that a dung-hill hen sits. I have found their nests, when a boy, and have endeavoured to take the old Pheasant, but never could succeed; she would let me almost put my hand upon her before she would quit her nest; then by artifice she would draw me off from her eggs by fluttering just before me for a hundred paces or more; so that I have been in constant hopes of taking her. They leave their nests as soon as hatched, and I believe they live at first on ants, small worms, &c. When they are a few days old, they hide themselves so artfully among the leaves, that it is difficult to find them: as they grow up they feed on various berries, fruits and grain of the country; grapes they likewise are fond of in the season; but the Pheasant is more particularly fond of the ivy berry. I do not know any other animal that feeds on these berries: I know they are poison to many. Though the Pheasant hatches many young ones at a time, and often sits twice a year, the great number and variety of hawks

in

in Maryland feeding on them prevents their increasing fast.—The beating of the Pheasant, as we term it, is a noise chiefly made in the spring of the year by the cock-birds ; it may be distinctly heard a mile in a calm day. They swell their breasts like the pouting pigeon, and beat with their wings, which makes a noise not unlike a drum in sound ; but the Pheasant shortens each sounding note, till they run one into another indistinguishably like striking two empty bottles together.”

In order to perfect, as far as I am able, the history of this bird, I shall give a quotation from Byron Lahontan's voyages to North-America, published in English. See vol. first, page 67th, where he speaks of a bird found near the lakes of Canada, which I think can be no other than the above described, though the names given them disagree.

Lahontan says, “ I went in company with some Canadians on purpose to see that fowl flap with its wings. I believe this sight was one of the greatest curiosities in the world ; for their flapping makes a noise much like a drum for about

the space of a minute, then the noise ceaseth for half a quarter of an hour, after which it begins again. By this means we were directed to the place where the unfortunate More-hen sat, and found them upon rotten mossy trees. By flapping one wing against another they mean to call their mates, and the humming noise that ensues thereupon, may be heard a quarter of a league. This they do only in the months of April, May, September and October; and, which is very remarkable, the More-hen never flaps in this manner but upon one tree. It begins at break of day, and gives over about nine o'clock in the morning, till about an hour before sunset, then it flutters again and continues so to do till night.

THE SPUR-WINGED PLOVER.

Paul Lucas, in his *Voyage to the Levant*, edit. in 3 vols. 12mo, printed at Rouen, *anno Domini* 1719, gives a very strange account of a bird found in the river Nile, which seems to me to be this very species of bird. Therefore, to amuse the reader, I shall transcribe his account
of

of it (see vol. iii. page 7.) “This bird is like a lapwing, and near of its bigness, which flew about and went into the crocodiles mouths, and throats, which were then extended on the water in the Higher Egypt, and were just before our author’s boat; and after they had staid a while, the crocodiles shut their mouths, and opened them again soon after to let them go out. The people told me that these birds, of which there was a vast number, feed themselves on what remains between this animal’s teeth, by sucking them; and as they have a kind of spur, or very sharp thorn on the tips of their wings, they prick the crocodile and torment him when he has shut his mouth, till he opens it again and lets them out; and thus they secure themselves from the danger they were in. Likely these are the birds which Pliny calls *Trochilos*. *Beitar* an Arabian author tells such another story of a bird, but doth not mention its name.” As I have received one of these birds from the East-Indies, it is very probable it may be a native of the Upper Egypt, which is in or about the same latitude,

The

The BUTCHER-BIRD.

Mr. BELL, a curious and inquisitive gentleman, long a resident in Russia, informed his friend, Mr. Colinson, (April 5th, 1745) that the Great, or Ash-coloured Butcher-bird, is often taken by the bird-catchers in Russia, and made tame. Mr. Bell had one given him; and he fixed a sharpened stick, or long skewer, in the wall, for the bird to roost on, with the point outward: but the curiosity was, the singular nature of the bird; for if he let fly a small bird, either linnet or green-finch, he would presently fly from his perch, and seize the little bird in a particular manner by the throat, which stops his breath, and soon kills him. The next extraordinary thing observable was his carrying the bird he had just killed to his perch, and spitting it on the sharp-pointed stick, drawing it on with his bill and claws; and thus would he serve one bird after another, spitting them and letting them hang by the neck, until he eat them at his leisure. The instinct of spitting the dead birds is to enable him the better to pull them to pieces;

pieces ; for he has not strength to hold them, as a hawk does, in his claws, and pull them with his bill ; but being fast spitted, he has strength enough to dissect. These birds are much admired by the Russians for the diversion they afford them in seizing and killing their prey, and artfully hanging it up for their food. The bird above described is very near, and possibly may be the same with the Guiraru Nheengeta of Marcgrave.

Account of the NEEDLES, in the Isle of Wight.

In the beginning of June 1761, I had the curiosity to visit the Isle of Wight, where I spent a week in seeing what was curious in that part of the island, and went off to sea several times under the stupendous rocks and cliffs called the Needles. Many strangers of our southern counties visit these parts yearly on the same account. When we enter some of our great cathedrals, their greatness and solemn gloominess strike us with a pleasing reverential kind of chilling horror ; and when we view the magnificent palaces of sovereign princes, we are struck with
beauty,

beauty, harmony, and regularity, and a striking sense of the richness, power, art, and fine taste, that could form such terrestrial heavens: but, O! when I had launched a little way into the ocean, and taken a full view of this most amazing and stupendous work of nature, all the sensations produced by temples and palaces, the works of art, were like shadows compared with real substances. The stupendous greatness of the rocks strikes the beholder with chill horror, and amazement, never felt before. While a stranger is near them, he fears that some protuberant masses of the rock will give way and wreck his vessel, and drown the presumptuous spectator. It is necessary to keep a quarter of a mile's distance at least, to make any judgment of the height of the cliffs. In some places it is near perpendicular; in others overhanging; in others there are rows of shelves, or lodgments, for the birds called *Puffins* and *Razor-birds*, where they sit thick, in rows, tho' hardly distinct to be seen separately, but their motion discovers them. In certain places high in the cliff, as well as under water-mark, you see great chasms and deep caverns, that seem to enter far into the rock. Here and there are chryf-
tal

tal streamis and broken rippling waters issuing forth pretty high in the rock. The strata of chalk, stone, flints, &c. divided in some parts, on an almost plain surface, for the depth of six hundred feet, the heighth of the rock in many places affords great entertainment to a curious and inquisitive mind. It is strange to see sheep and lambs feeding near the water's edge in the lower part of this cliff, and not easily conceivable how they get thither without being precipitated into the deep, but they have the power of treading surely in places inaccessible to man. Though the birds are not counted eatable, yet many of them are destroyed through wantonness. When a gun is discharged from sea under the rock, they fly off in such amazing numbers as to darken the surface of the sea under them. Great numbers are always seen fishing in the sea, others sitting in the cliffs, and many always passing and repassing over your boat. The fishermen make baits of their flesh to catch lobsters, crabs, &c. The ignorant on this part of the island suppose that these birds are found in no part of the world, but at the Needles. The face of this stupendous rock extends about four miles, and very nearly,

if

if not precisely, facing the south. The west point terminates in what is properly called the Needles, which are several vast rude obelisks, or pillars, separated by time and force of the sea from the main rock, and stand detached from each other, arising immediately out of the sea. These birds, they say, are seen here not much above two months in the year, and first appear in the beginning of May. The fishermen, who are always about these rocks, declare that these birds are seen three or four times in the winter, for a day or two each time, in as great numbers as at their breeding time; and that they know when to expect them, which is after a little mild weather, when the sun lies warm on the cliff, and the sea beneath is pretty calm, to give them an opportunity to seek their food. The top of the cliff is barren, chalky, and stony, down which feeds a great number of sheep, cormorants, shags, gulls, Cornish choughs, jackdaws, starlings, wild pigeons, and many sorts of small birds, breed annually on these rocks.

Having in the Essays given the opinions of many ingenious men, respecting Birds of passage, we shall, in further elucidation of the subject, give the following

A
C A T A L O G U E

Of the NAMES of the
BIRDS, BEASTS, FISHES, INSECTS, PLANTS, &c.

CONTAINED IN

EDWARDS'S Natural History of Birds,
And his Gleanings of Natural History, in a
Generical Order.

*Of Birds that take their prey in the day-time, and
first of*

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C A T A L O G U E

Des NOMS de tous les
Oiseaux, Bêtes, Poisons, Insectes, Plantes, &c.

CONTENUS DANS

l'Histoire Naturelle des Oiseaux d'EDWARDS;
Et dans ses Glanures de l'Histoire Naturelle;
dans un Ordre Generique.

*Des Oiseaux qui prennent leur proie de jour, et en
premier lieu des*

Aigles.

	PLA.
L'Aigle à la queue blanche -	1
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Vautours.

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